FOOD MANUFACTURE
Incorporating Food Industries Weekly
HILL LIMITED, 17, STRATFORD PLACE, LONDON, W.1 MAY 1, 1947

This is our
NEW LABEL

This new label provides greater clarity of subject and more detailed information whilst retaining essential features which have for so long been familiar to our friends throughout the world.

We are confident that our new label will further enhance the acceptability of our products which in all other respects remain unchanged and which retain the same high quality that has been our tradition for nearly a hundred years. Please note one exception, "Buttabelle" will continue to bear its present well-known label.

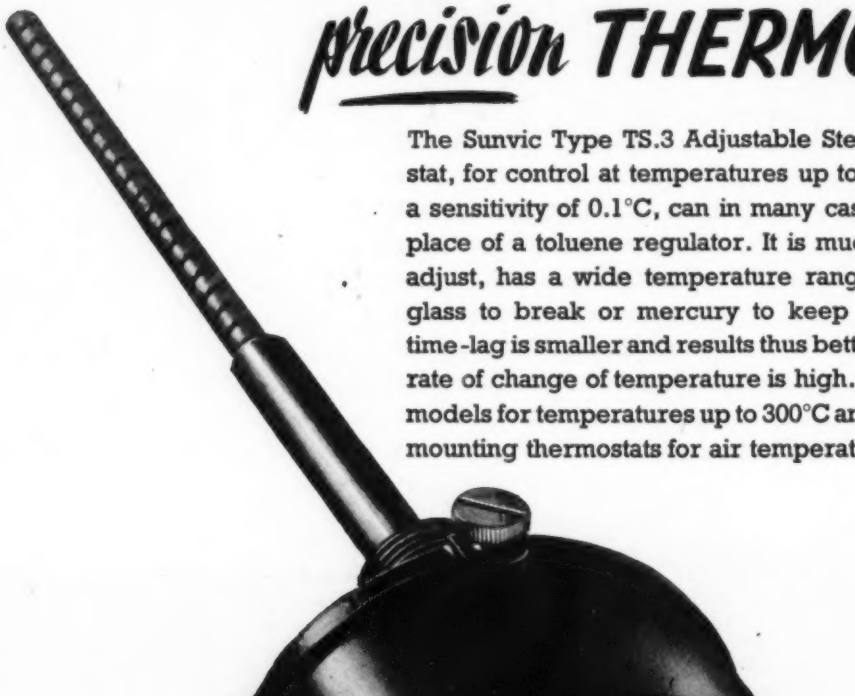
BUSH

Branches throughout the World

W. BUSH & CO. LTD. LONDON. E.8. ENGLAND

The REALLY ROBUST precision THERMOSTAT!

The Sunvic Type TS.3 Adjustable Stem Thermostat, for control at temperatures up to 150°C with a sensitivity of 0.1°C, can in many cases take the place of a toluene regulator. It is much easier to adjust, has a wide temperature range—and no glass to break or mercury to keep clean! The time-lag is smaller and results thus better when the rate of change of temperature is high. Other stem models for temperatures up to 300°C and also wall-mounting thermostats for air temperature control.



WRITE TODAY FOR LIST AT.10/9

SUNVIC CONTROLS LTD., STANHOPE HOUSE, KEAN STREET, LONDON, W.C.2

SUNVIC

TAS/SC 131

FOOD MANUFACTURE

Vol. XXII, No. 5 May 1, 1947

The Five-Day Week

IF G. K. Chesterton were alive today he would no longer be the undisputed master of paradox. Every realistic commentator upon industry and economics would be challenging his position. Paradox rears its head in all directions. Greater production efforts are called for, but all too often each spurt is brought to a halt through a shortage of raw materials. Factory managers struggle to devise means of increasing output per man-hour, and hopefully forget that their total output is in any case dictated by fixed allocations of primary supplies. Cheap money accentuates the tendency towards inflation, yet the cheap money is required by the Treasury to support the enormous subsidies that are claimed to prevent inflation. The American loan was supposed to give us a breathing-space for recovery, but the long-term conditions associated with it make it more difficult for us to recover at all. But perhaps the most obvious paradox of the collection is our general attitude to the problem of working hours, especially working weeks. Harder work and shorter hours are the messages on banners in the same processions.

It is argued that output rises when hours are shortened because production increases have generally followed the reduction of excessive overtime. Few industrialists would dispute the fact, but many question the deduction especially when it is carried to indefinite extensions. The five-day week may be as effective as the five-and-a-half day week in those industries that have experimented with it, but this does not prove its universality. Those factories which have pioneered the change are not unnaturally the kinds of factories whose product and consumer-service fit in with a five-day week without difficulty—were this not so, the experiments would not have been attempted. In many cases the five-day week imposes longer working days, and if it is true that longer hours tend to reduce output then daily production might be expected to fall. No one points to the system that is long-established in many offices whereby the workers enjoy a five-day week in rotation, yet this might well be applied to many small factories. Saturday mornings have often been effectively used for plant maintenance after continuous operation from Monday to Friday, and this might be regarded as obvious and efficient planning; the five-day week sweeps away this stratagem of management, and in many factories where the product has a high wear-and-tear effect upon the plant, maintenance must intervene in the five days of output.

Industries or branches of industry whose work is seasonal—as in so many food processing factories—can no longer look towards partly seasonal labour at a time of full employment. The universal cry of a standard week of 47, or 44, or even 40 hours for 50 or 51 weeks in the year fits their conditions and problems about as well as a stock-sized suit fits a short man with a luxurious stomach; though a year of 2,200 hours might give management a chance to satisfy the demands of the work and the worker.

The hour is an inevitable unit of working-time, but there is nothing sacred about the aggregation of hours in five-day or five-and-a-half day periods. At a time when scientific thought and research is being applied to almost every industrial problem, the all-important subject of hours of work—a primary base for any scheme of works management—is being settled by assumptions and generalisations, by majority sections of public opinion in which the experience of successful management is at best a mere whisper. Those who declare that shorter hours are certain to bring higher production occasionally explain that it is achieved by installing more machinery, but when the works manager looks for extra machinery he finds himself in a long queue, faced with the problem of a reduced week in 1947 but with only blueprints for extra machines that might be delivered late in 1948.

Glucose Shortage Hits Industry

Glucose shortages resulting from the stoppages throughout the major part of England in February and March are developing and extending to those parts of the country which were not themselves involved in the power cuts. It is believed that the situation may deteriorate still further and that a considerable number of industries may be affected over a period of some months. Already the shortages are forcing the confectionery industry to short time. The 50 per cent. cut in coal has meant a considerable decrease in steam production and the lack of raw materials has led to a further limitation in production.

Taking confectionery manufacturing as a typical industry, experience has been that production has dropped considerably and that deliveries are some two weeks in arrears. The problem of distribution from factories has also been prominent. Even where factories had goods packed and ready for distribution it has not always been possible to clear them. No credit is too great for the transport workers, who have maintained almost continuous delivery services under conditions which have been more difficult than at any time in the history of road transportation.

Food Poisoning from Eggs

Occasional outbreaks of food poisoning constitute a reminder that the egg is a potential source of infection. Ducks' eggs have frequently been proved to have produced outbreaks of Salmonella infections. Hens have been found infected with *S. pullorum*, fortunately a type not pathogenic to man. But R. F. Gordon and A. Buxton (*J. Hyg. Camb.*, 1945, **44**, 179) isolated *S. thompson* (which is a strain which can cause human food poisoning) from chicks, during 1943 and 1944, although the organism was not isolated from the eggs themselves.

The egg of the hen has rarely been responsible for food poisoning outbreaks and may be considered as practically safe.

The results of investigations into the Salmonella content of dried egg powder show that it does not partake of the innocuousness of fresh eggs. Examining Canadian egg powder W. E. Gibbons and R. L. Moore (*Can. J. Res. F.*, 1944, **22**, 48) found Salmonella strains in 7·4 per cent. of the samples, all but a small percentage (*S. pullorum*) being potentially pathogenic to man. M. D. Schneider (*Food Res.*, 1946, **11**, 313) isolated pathogenic Salmonella organisms from 0·67 per cent. of 901 samples examined.

Useful work has been carried out by M. Solowey, E. H. Spaulding and H. E. Goresline (*Food Res.*, 1946, **11**, 380), in the search for sources of infection of the egg powder. They found Salmonella organisms from the shell surface of 1 per cent. of clean intact eggs, from 5 per cent. of dirty eggs and 5 per cent of "washed-dirty" eggs. Micro-organisms derived from faeces, manure, and soil may penetrate through the shell and shell membrane and develop within the egg meat if temperature and humidity conditions are favourable. The penetration of *S. aertrycke* through the shell has been studied by various workers.

From the standpoint of public health the importance of the isolation from any food product of a number of Salmonella types most of which have been implicated in outbreaks of food poisoning cannot be overestimated.

Preventive measures have been studied, some of which have achieved a certain degree of success and others not.

In view of the extensive use of dried egg powder by the community, rigid control and the enforcement of bacterial standards should be carried out without delay.

Scottish Meat Supplies

The seriousness of the meat supply position in Scotland has been pointed out by meat traders following an emergency meeting of the Scottish Federation of Meat Traders. The crux of the situation is the belief that the 1s. 4d. per week ration cannot be honoured by the trade under present allocations. The most important effect will be the loss of the 5½ per cent. carcase meat which has been used to date for sausage production. The fact that the manufacturing butcher holding a group manufacturing licence is not affected by the cuts leaves the factory manufacturer in an advantageous position as against the individual butcher. And where, as in Scotland, the bulk of production has been based on individual production rather than on mass production methods the cut will not only affect a large number of retailers but many of their customers. Sausages are so useful as off-the-ration standbys that the cut will be the more severe.

The Executive Committee of the Aberdeen, Banff, Moray, and Kincardine Master Butchers' Association have protested to the Scottish

Federation of Meat Traders against this cut and have also criticised the present quality and quantity of meat which consumers in the north-east have to accept as their ration.

Mr. A. Matheson, chairman of the Executive Committee, speaking at a recent meeting of the Association, indicated that the general butcher had now nothing to manufacture into sausages.

Printing Ink on Food Packages

Comment has been caused by the fact that certain printers have been unable to guarantee that ink used for the printing of leaflets to be inserted in food packages is odourless. They have been able to commit themselves only to the statement that the ink used contained no arsenic and conformed with the Food and Drugs Acts.

A spokesman for printing ink manufacturers said: "While it is impossible for manufacturers to give more than a general and protective guarantee that their product conforms with the Food and Drugs Acts, in actual practice the best printing inks may be said to be free from objectionable and harmful odours. Research has practically eliminated former problems concerning odours; and with the development of quick-drying inks (subject to the return of normal conditions of supplies of raw materials) there should be no complaint of odour in food packages provided that printers and packagers use the best ink."

According to the executive officer of a printing ink syndicate "it is impossible to eradicate smell. Everything smells—even iron and steel—but it is possible to eradicate smells which are harmful and objectionable. In other words, good smells are used to kill bad ones. Printing ink manufacturers do everything possible to ensure that their product is unobjectionable."

A packaging director said that in many years' experience he had never met with a complaint. "The amount of printing ink used on a circular or booklet was so small that it could not affect the contents of a food package if the ink used was by a reputable manufacturer. The responsibility of using the right kind of ink was for the buyer of the package, who should ensure that the printer used suitable ink."

The production of an odourless ink was stated by a research officer to be chemically and physically impossible. However, smells that were objectionable could be masked, and this was done. The secret of a suitable printing ink was quick-drying. This made the ink practically odourless, and quick-drying inks were in process of development, though this was hampered by the shortage of linseed oil.

A chocolate manufacturer recently submitted to a research organisation a packet of several hundred chocolate wrappers with the information that they smelt of printing ink. Investigations showed that they did indeed smell if flicked with the fingers as one would flick a pack of cards. Taken separately, however, there was no smell, and for practical purposes each wrapper was odourless.

Certain American ink manufacturers claim to produce quick-drying odourless ink, which if used on presses fitted with steam applicators (causing the ink to dry and harden immediately), enable waxing, folding, and die-cutting operations to be carried out as soon as the printed sheets come off the presses.

It would seem, therefore, that if only the best printing inks are used and adequate airing given, there should be no fear of contamination of food products.

Bacon Production

The plight to which Britain's pig industry has been reduced by the shortage of feedingstuffs is revealed by the decline in the output of bacon. In February the weekly production of bacon and ham averaged only 1,380 tons, compared with 2,200 tons in the corresponding month of 1946, and 2,250 tons in February, 1945.

Slaughterings of pigs for bacon manufacture are also lower, the average being only 15,300 a week in January, against 24,700 a week in January, 1946, and 20,400 in January, 1945. The cut in the allocations of basic feedingstuffs early last year was followed by an immediate rise in slaughterings as farmers reduced their herds to meet the new situation, and in July, 1946, the weekly slaughterings of pigs for bacon averaged 35,200—the highest figure for a few years, and the output of bacon and ham that month averaged 2,700 tons a week.

Basic rations for pigs are being increased again from May 1, and the Agricultural Departments expect a substantial increase in the marketing of fat pigs throughout 1948.

Ministry of Food statistics throw useful light on the changes in the average weight of baconers since the outbreak of war. In 1937 a baconer produced, on average, 1·28 cwt. of bacon and

ham. But the war has swept away the grading scheme under the old pig marketing contracts, and in 1946 a baconer produced an average of 1·74 cwt. of bacon and ham.

Discussions have taken place between the Bacon Marketing Board and the National Farmers' Union with a view to co-operation in bringing about a progressive expansion of the pig industry with the aid of the extra rations. The Board's representatives at these discussions included Sir John Bodinnar, the chairman, Mr. David Black and Mr. Martin Lewis.

Cut in Extraction Rate Urged

Urging a 5 per cent. cut in the flour extraction rate in the national loaf, Mr. Donald B. King, president of the National Association of British and Irish Millers, said in London recently that this would provide enough extra animal feedingstuffs to produce 72,000,000 dozen more eggs per year.

"A decrease down to the 80 per cent. extraction rate would provide," he said, "additional animal feedingstuffs representing in terms of milk approximately 150,000,000 gallons more per year; in terms of eggs 72,000,000 dozen more per year; or in terms of bacon, pork, fats, and other pig products of 50,000 tons more per year.

"As far as the loaf itself is concerned, the reduction would result in a vast improvement in quality. It would bake better, keep better, and be much more palatable, and, coupled with the all-round improvement in our dietary resulting from the increased availability of animal feedingstuffs—leading to more simple food such as butter, cheese, eggs, and bacon—would have a considerable effect on the morale of the nation."

Digestibility of Fat

In exploding the theory that fats and fatty foods are indigestible, the *Journal of the American Medical Association* (132, 7, p. 388) instances the many investigations carried out in this field.

It is pointed out that fats of animal and vegetable origin show high digestibility in man. In connexion with this property of hydrogenated fats, investigations have demonstrated that by adjusting the melting point, either through blending or through altering the degree of hydrogenation, the coefficient of digestibility varies inversely with the melting point. The elimination of fats with long chain saturated fatty acids enabled infants to digest and absorb fats efficiently. On the other hand, stearin, whether in mixed glycerides or in mixtures of fats, appeared to decrease the coefficient of digestibility. So long ago as 1925 it was reported that the fat in oleomargarine was more than 95 per cent. digested, and recent investigations have shown that the digestibility of the fat in the newer vegetable margarine was the same as that for butter when compared in human subjects.

Fat is the richest source of food energy, yielding 9·3 Calories per gram in metabolism, the absorption of which in some quantities is essential for the entrance of certain of the vitamins into the body.

It is clear from scientific evidence that fat is as well digested as are the carbohydrates and proteins, and the misconception as to its indigestibility seems to arise from the fact that the satiety value of fats is high.

Papin's Digester

The birth 300 years ago of Denys Papin, collaborator of Huyghens and Boyle, will be commemorated by engineers, since this Frenchman conjured forth a crude form of steam-engine before Savery, Watt, and others got to work. Papin's invention is very much the concern (or should be) of food technologists. A year after his election to the Royal Society in 1680, and three years before he became "temporary curator of experiments" to that body, this refugee from Blois described his "digester," an apparatus designed to work above 100° C. in producing an edible jelly rather than steam power. "I took beef bones that had never been boiled but kept dry for a long time, and of the hardest part of the leg; these being put into a little glass pot with water . . . and after the vessels being cooled I found very good jelly . . . and having seasoned it with sugar and juice of lemon, I did eat it with as much pleasure as jelly of hartshorn."

Those words of Papin show his intentions with the digester. Like Appert in later years this French physicist had become interested in food preparation, an interest which drove him to give the world the first closed "boiler"—a bone-boiler rather than engine-boiler—fitted with the first safety-valve working on the lever plus weight principle. It was only when he failed to settle once more in England for any period on his second visit here that he went to Marburg as professor, and at Leipzig in 1690 published his idea for a steam condensing engine for pumping water.

Processed Cheese

SPECIALLY CONTRIBUTED

The manufacture of processed cheese has advanced considerably in recent years, both in this country and abroad, and particular attention is now being directed to further improvements in France and Switzerland.

IN France the *Station Centrale de Microbiologie* established for the farming industries has sponsored research in this field, some of which has been described by R. Faivre (*Chem. et Ind.*, 1946, **56**, 373-381). The director of the Central Station emphasises the importance to France of this opportunity of producing new and original foods of varied taste and attractive appearance for the home market and abroad.

Physico-chemical Data on Casein

Casein exists in milk as a colloidal suspension of phospho-caseinate of lime. It is easily polymerised, in this case apparently by calcium phosphate; and in the process of cheese manufacture it takes this form, pressure playing the role of catalyst and calcium phosphate that of plastifier. Structure of the casein molecule may be deduced from its hydrolysis products, forming two groups of amino acids: (*a*) with hydrophobic apolar radicle, and (*b*) with hydrophile polar radicle. According to Fischer, polymerisation of amino acids may take place either by peptic or cyclopeptic linkage; and further, according to Dervichian, the hydrophobic derivatives are on one side of the casein molecule and the hydrophile chains on the other. But there are other kinds of linkage so that the structure is very complex, as illustrated, *e.g.*, by the work of Levene, Hill, and Schmidt on the phosphorus linkage. Acidity of casein is closely related to the fact that there are, in its molecular structure, a much larger number of carboxyl than of amino groups, owing to the existence of di-acids of the glutamic type; and in natural cheese the acidity results not only from that of the casein but also from lactic acidity owing to bacterial destruction of lactose and from fatty matter acidity (fatty acids). Moreover, cheese acidity is apt to increase in other ways, *e.g.* bacterial changes in casein which cause the specific cheese aroma, with formation of amino acids and even ammonia. Acidity may therefore vary rather widely, from *p*H 4·5 to *p*H 7.

The *p*H changes in cheese under varying conditions are important and significant. While the *p*H of a phosphoric acid solution is 1·6, that of the same solution to which cheese has been added, *e.g.* a finely ground lean cheese (*gruyère maigre*), is 4·6; that of a solution of trisodic phosphate may be 12·7, but with cheese added it is lowered to *p*H 8. Addition of a melting agent or solution to cheese changes the progress of swelling of casein. There is some absorption of the solution, say, of disodium phosphate. Owing to feeble diffusion of electrolytes it is desirable to react solution with cheese as long as possible, either cold, with stirring and mixing, or hot.

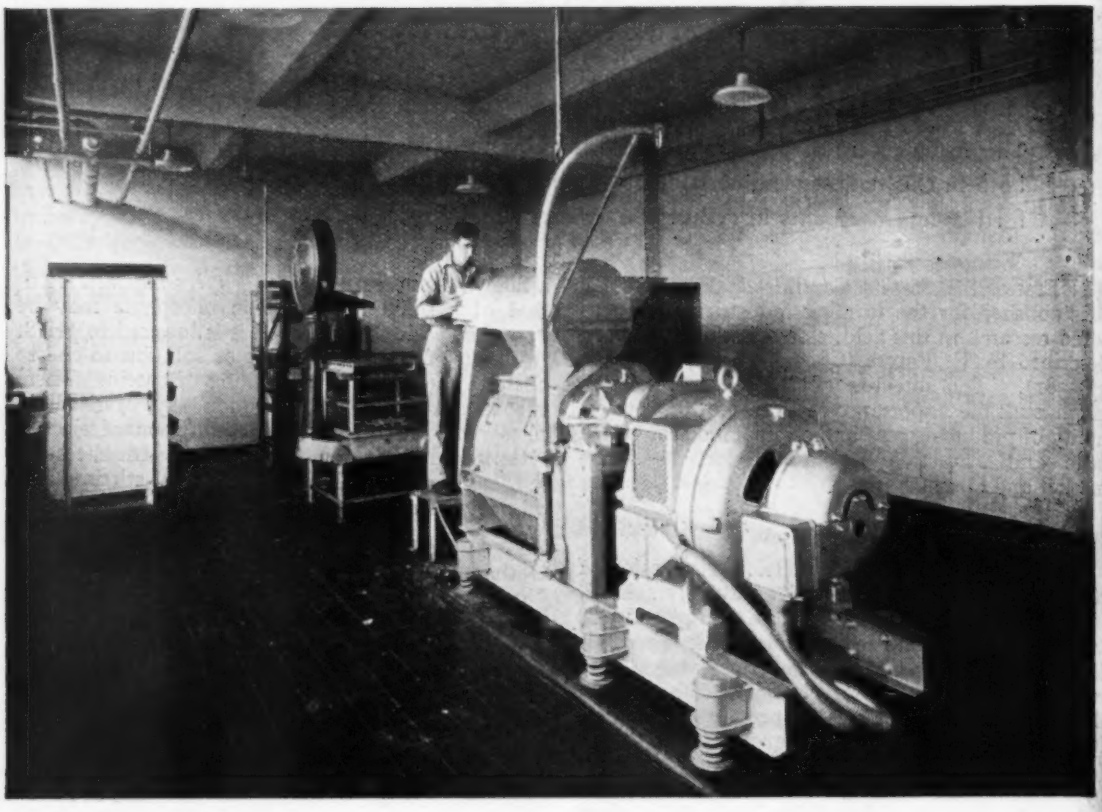
Optimum *p*H

If a fat cheese is heated in presence of small amount of water to compensate evaporation and without fusion salt the albuminous membrane enveloping fat globules is destroyed at about 60° C.; and at about 65° C. the casein coagulates and gives up water. The cheese is thus divided into its three principal constituents. The aim in adding fusion salt is to prevent such separation. By using suitable salt solutions, say mixtures of mono- and di-sodic phosphates, it is possible to vary *p*H from 4·5 to 8·7. Optimum *p*H has been found to be usually about 5·7–6, giving a smooth homogeneous paste of good flavour. Change in texture of the cheese melt and thus also deformation of the casein molecule may be due in part to electrostatic repulsion. The addition of fusion salt not only prevents separation into constituents, noted above, but also gives the optimum *p*H and emulsifies the fatty matter and water. To this end the following procedure is necessary:

(*a*) Dissolve quickly a certain amount of casein to provide a protective film for the fat globules by lowering surface tension in accordance with Gibbs' law. Solution of casein is proved by increase in percentage of nitrogen soluble in the melt. The decalcifying action of the fusion salt must also be noted.

(*b*) Swell the casein, or increase its weight and volume by water absorption through the hydrophile groups, COCH and NH_2. Obviously a cheese is hydrated more or less readily according to its content of such groups.

(*c*) Finely disperse the casein. Such dispersion increases according to valency of electrolyte anion.



Grinding cheese for processing.

Further, the fusion salt should not provoke saponification, and should be sufficiently soluble not to crystallise in the melt.

Variation of *p*H of a cheese melt with time shows a definite discontinuity. Consider, *e.g.*, fusion of a fat gruyère of *p*H 5·7 by addition of a suitable fusion salt (3 per cent.) of *p*H 8·2 in aqueous solution; there is at first a marked and rapid change in *p*H corresponding to immediate reaction between solution and cheese, but equilibrium is not attained until after several days. There is progressive polymerisation of the casein through the calcium ion, on which the stability of the melt depends. The governing factors in fact are: temperature of fusion, rate of cooling of melt, and nature of fusion salt used. There is also a breaking down of the amino acids under bacterial action, leading to formation of alkaline products as in ordinary cheese. The *p*H of the melt should in such case normally tend to rise during storage, and it is in this direction that the liquefying power of the fusion salt is important. If this power is satisfactory in the optimum *p*H range (5·5 – 6) then the *p*H remains quite constant for several months, together with uniform texture and maintenance of the right aroma. But if the fusion salt hydrolyses, with formation of acid products, or is otherwise lacking in liquefying power, then there is more or less rapid deterioration of the cheese melt.

Fusion Salts

The salts used in solution for the melt should have a monovalent kation and a polyvalent anion, and be used in just sufficient amount to give a stable homogeneous emulsion. Usually a 3 per cent. solution is best. Many different salts have been tried, the first being sodium citrate or phosphate, *i.e.* those normally present in milk. Although sodium tartrates and sulphate have good melting or liquefying qualities they are not satisfactory in practice; and the same applies more or less to salts of adipic and maleic acid. It was subsequently found that emulsifying power increased with anion valency; and in this connexion it may be remarked that sodium phosphate is trivalent

Cooking of processed cheese.

Packing machinery for processed cheese in portions.

May, 1947

Packing 5 lb. loaf processed cheese.

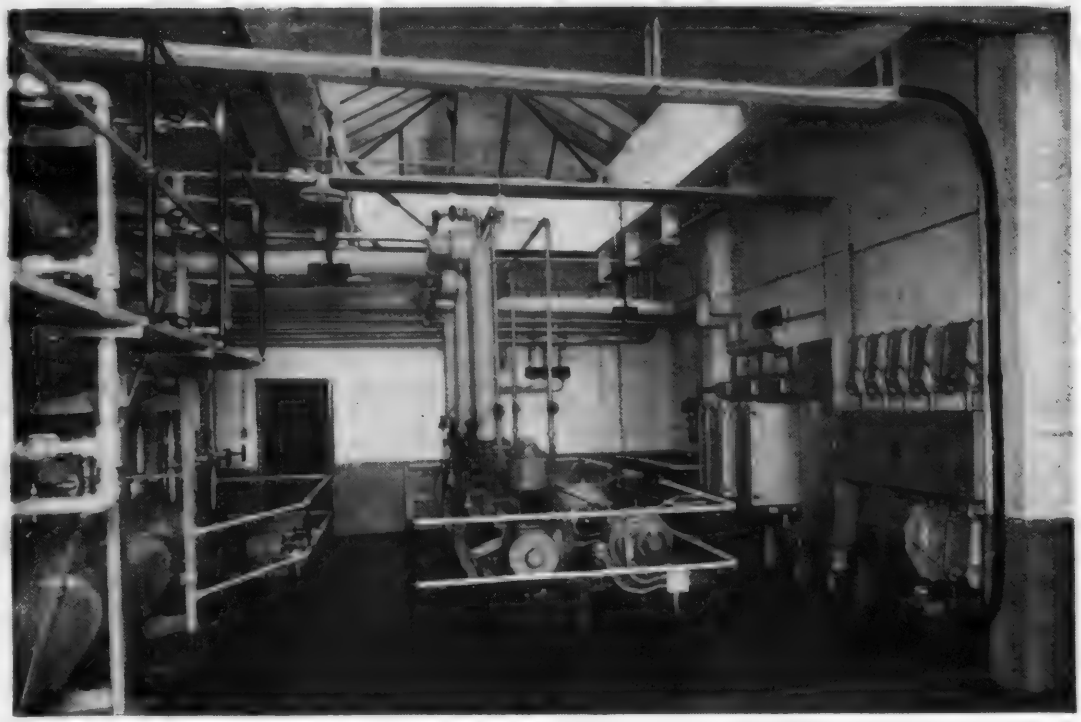
and pyrophosphate tetravalent. Ortho-, pyro-, meta-, and poly-phosphates have been used, and experience in the processed cheese industry has shown that the best results are obtained by use of polyphosphates instead of reconstituted products of meta- and pyro-phosphates. Their acidity or *p*H ranges between 4 and 12 according to mode of preparation.

Liquefying or Emulsifying Power

In regard to liquefying or emulsifying power, the metaphosphates are entirely lacking in this; whilst mono- and di-sodium phosphate form a solution in which liquefaction is maximum at *p*H 7·1. Only the polyphosphates have the right action at *p*H 5·5 – 6, which is that required in the processed cheese industry. The different phosphates have varying action on the calcium ion; some, as trisodium phosphate, precipitate this as insoluble phosphate of lime, while the metaphosphates form complexes insoluble in water and have the so-called sequestrating power. The polyphosphates are similar, but are in other respects more suitable as melt agents.

Since hydrolysis is an important factor in this work special study has been made of it in connexion with cheese melts. It has been found that sodium polyphosphate is very resistant to hydrolysis in the optimum *p*H range; but there is risk of this if the polyphosphate is heated sufficiently long in acid solution (*p*H<2), with consequent formation of ortho-phosphate. Polyphosphate is the only one indeed that really combines with casein, always provided the *p*H is right.

Portion machine for processed cheese showing conveyor for filled boxes.



Refrigeration compressors for main cold store.

Manufacture of Processed Cheese

Suitably selected cheese, which should be of best quality, is thoroughly cleaned, decrusted, reduced to small pieces and finally ground. It is then liquefied by heating with water and a fusion salt. At a temperature of about 70° C. the paste has the appearance of a smooth unctuous cream, whence the name *crême de gruyère* when this particular type of cheese is used as starting point. The melted mass is then cooled in moulds lined with aluminium foil and hardened by cooling, giving (*a*) *crême de gruyère* when the water content of the melt is less than 50 per cent., or (*b*) cheese spread when the water content is between 50 and 56 per cent.

The equipment required comprises washing machines, with or without steam; decrusting machines—though this operation is often done by hand; slicing, grinding, and mixing machines; melting plant fitted with either direct or indirect heating or both, often in the form of kneading or the like vessels (*pétrins* or *bassines de cuisson*); and finally moulding or shaping and packing plant.

It must again be emphasised that the best quality cheese should be used as raw material, and it must be very carefully decrusted. The crust removed may be used in cattle food. Complete removal of this together with thorough washing are necessary to avoid bacterial contamination. The cheese usually preferred is *gruyère* or *Cantal* (similar to Cheddar), and usually a mixture of these in different stages of ripening is chosen, *e.g.* one-third is older *gruyère* of six to twelve months' ripening and two-thirds young *gruyère* of one to two months: or mixtures of different kinds of cheese, *e.g. gruyère* with the softer sorts such as *Reblochon, Munster, Marolles, Camembert, St. Nectaire, Tomme de Savoie, Bleu d'Auvergne.*

Other additions may be made in the form of curds or whey, the former to correct acidity and the latter to increase protein content. During the war the use of whey, *e.g.* from ordinary cheese manufacture, for this purpose was much in evidence in France. It is pasteurised, freed from fermentation lactose, and usually concentrated. The milled cheese intended for the melt must be carefully tested for water and fat content, ionic acidity (*p*H) and total acidity, soluble nitrogen, and bacteria.

As already stated, the polyphosphates have a fairly wide range of *p*H values, and the *p*H selected in any case must largely depend on the

(*Concluded on page* 220)

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, April 1, 1947, page 173.

No.	*Date.* 1946.	
		PRICE FIXATION ORDERS
2058	Dec. 5.	Rhubarb (Maximum Prices) (Revocation) Order. Revokes S.R. and O. 1944 No. 1270; 1945 No. 1487.
2109	,, 12.	Cheese (Control and Maximum Prices) Order. Revokes S.R. and O. 1943 No. 1766; 1945 No. 1515; 1946 Nos. 588, 1545.
2124	,, 13.	Order amending the Feeding Stuffs (Regulation of Manufacture) Order, 1946.
2125	,, 14.	Order revoking the Cucumbers Order, 1946. Revokes S.R. and O. 1946 Nos. 613; 753.
2160	,, 19.	Order amending the Soya Flour (Control and Maximum Prices) Order, 1946. (Prices.)
2199	,, 21.	Order amending the Salmon (Maximum Prices and Distribution) Order, 1944. Revokes S.R. and O. 1945 No. 688; 1946 No. 709.
2207	,, 23.	Order amending the Dried Fruits (Control and Maximum Prices) Order, 1943. Revokes S.R. and O. 1945 No. 555; 1946 No. 1515.
2210	,, 24.	Order amending the Fish (Control and Maximum Prices) Order, 1946. (Halibut, cod, saithe; herrings; bucklings.)
		MILK
2150	Dec. 17.	Milk Non-Priority Allowance Order. (2½ pints ration.) Revokes S.R. and O. 1946 No. 1412.
		POINTS RATIONING
2056	Dec. 4.	Order amending the Food (Points Rationing) Order, 1946. (Egg products; canned macaroni; Irish stew; canned meat products; canned fish; barley flour.)
2241	,, 30.	Order amending the Food (Points Rationing) Order, 1946. (Canned sausages, figs, matzos; canned milk, marmalade; jams, meat hash, cheese, cereals; M. and V. packs.)
		RESTAURANTS
2123	Dec. 13.	Establishments (Christmas Turkeys) Order, 1946.
		VEGETABLES
2126	Dec. 13.	Order amending the Onions Order, 1946. (Imported onions.)

Vitamins in Poultry Feeding

VITAMINS more than any other nutrient are liable to deteriorate with age or under improper conditions of storage and lose their potency. Light, temperature, and aeration are only a few factors that may affect them.

The most prevalent conditions of vitamin deficiencies in practice are the marginal shortages which are not sufficiently severe to promote characteristic symptoms of a particular vitamin deficiency, but the continual effects produced on poultry are those of general unthriftiness, stunted growth, and poor feather development in young birds and, in adult stock, a run down condition resulting in lower egg production. In more severe cases the individual vitamin deficiencies may show up; for example, curled-toe paralysis, an obvious symptom of a deficiency of riboflavin, and perosis, a possible deficiency of the vitamins choline or folic acid or the mineral manganese.

Fortunately, of the many vitamins required by poultry, only vitamin A, vitamin D, riboflavin, choline, and panthothenic acid, are likely to be lacking in feeds under practical conditions.

The plant leaf is the source of most vitamins, and particularly so of carotene. Owing to the rapid deterioration of green plants great care should be taken as to proper curing and storage. Vitamin A is also supplied by fish oils; vitamin D by sunshine and fish oils; riboflavin by liver meal, yeast, milk products, well-cured greenfeeds, distillers or fermentation solubles or synthetic riboflavin; choline by yeast, fish meal, soya bean meal and synthetic choline chloride; pantothenic acid by alfalfa meal, yeast, liver meal, and synthetic calcium pantothenate. Recently it has been shown that factors as yet undetermined, presumably of a vitamin nature, are present in dried distillers' solubles, dried brewers' yeast, dried whey, casein, and dried liver.

Natural sources of vitamin concentrates supply other nutrients which are often important. Thus when using a synthetic vitamin to satisfy a deficiency, it is necessary to be certain that it is the only vitamin lacking and there is a proper balance of all nutrients.

A useful booklet on the above subject is No. 541, *Poultry Feeds and Feeding*, available from the Dominion Department of Agriculture, Ottawa.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Detergency in the Food Industries

J. C. L. RESUGGAN, A.R.I.C.
Chief Chemist, The British Hydrological Corporation

Part II

DETERGENCY is the art or science of the removal of an unwanted phase from a wanted phase or, in other words, of removing deposits of dirt, oils, greases, or other unwanted materials from the surfaces of objects, materials, or textiles.

Cleaning can be effected in a variety of ways. Carpets can be cleaned by beating or by the means of an applied vacuum. Oils can be removed from metal parts by dissolving them in a suitable solvent, but, from the earliest times, by far the greatest cleanser has been water.

It was found by the empiricism common to all technological processes prior to the scientific age that the cleansing power of water could be enhanced by the addition of certain substances to it. The two earliest substances to be used in this connexion were probably fuller's earth and soda ash. From the scientific age a vast number of substances have come into being, many of which have useful properties in detergency.

Main Factors in Detergency

The principles of detergency, as they are now known, are fundamentally the same for all aqueous cleaning processes, but techniques differ according to the industry in which the cleaning process is used and emphasis may be laid in one industry more upon one factor in detergency than upon another.

In the food industry we are mainly concerned with cleaning glass or metal surfaces and removing from them unwanted deposits, which are often greasy in nature. We are also concerned in these operations with the removal and destruction of bacteria—often a much more important consideration in the food industry than the merely aesthetic one of obtaining a shining surface.

The origin of the use of alkaline substances in cleaning operations is lost in antiquity, but it seems that the use of sodium carbonate, obtained from the Natron Lakes, was known in ancient Egypt. The principles involved in detergency of this type are not simple, and the known factors have to be balanced in a detergent with due consideration to the nature of the cleaning operation to be performed.

The main factors in detergency are the saponification of fats, emulsification and deflocculation, wetting, rinsability, buffering, and sterilising power. Although this classification has not been arranged in any particular order of importance it will be useful to take these sections one at a time to discuss the principles underlying them and the method in which the total factors can be blended to produce an efficient detergent.

Saponification of Fats

Sometimes referred to as hydrolysis, saponification is largely a function of the caustic alkalinity of the detergent. Esters are hydrolised by caustic alkalies according to the general formula

$$RCOOR' + NaOH \longrightarrow RCOONa + R'OH.$$

Thus, in a fat which is a glyceride, *e.g.*

$$\begin{array}{l} CH_3(CH_2)_7CH:CH(CH_2)_7.COO.CH_2 \\ \qquad\qquad\qquad\qquad\qquad\qquad\quad \backslash \\ \qquad\qquad\qquad\qquad\qquad\qquad C_3H_7.CO.OCH \\ \qquad\qquad\qquad\qquad\qquad\qquad\quad | \\ \qquad\qquad\qquad\qquad\qquad\qquad C_3H_7.CO.O.CH_2 \end{array}$$

hydrolysis would result in one molecule of sodium oleate, two molecules of sodium butyrate, and one molecule of glycerol. A reasonably high temperature and high *p*H is required for the hydrolysis of fats and this, therefore, is one good reason why detergency operations in the food industry should be carried out at as high a temperature as possible.

Emulsification will also be assisted by saponification as the lowering of interfacial tensions greatly aids the process. In point of fact, not very much saponification actually takes place where the time of contact is limited, but even the little which takes place is valuable and assists the cleaning process because of the formation of soaps which tend to lower the surface and interfacial tensions of the solution. Saponification should, therefore, be always aimed at in the maximum degree possible.

Where milk and its products are concerned, it should be mentioned that their casein content may also be affected by this hydrolytic fission, but in a lower degree, and here the products may be ammonia, carbon dioxide, and amino acid fragments due to the disruption of the protein molecules. Generally speaking, however, these may not constitute more than a small fraction of the total matter actually saponified.

Emulsification

Emulsification is a most important factor where detergency is concerned because not all fats and grease will be hydrolised, and unless the detergent solution has good emulsifying properties cleaning will be poor.

Just as it is not possible to draw a hard-and-fast line between a true solution and a colloid sol, so it is not easy to say when the solution of one liquid in another ceases to be a true solution and becomes an extremely fine emulsion. Such cases depend upon the physical properties of the two liquids involved, but there is a number of cases where the appearance is that of a clear solution and the dispersed phase can be only detected in the continuous phase by reason of the scattering of the rays of a beam of light projected into it. Towards one end of the scale there is the true solution, and towards the other a visual emulsion. Modern theory holds that an emulsion is brought about by the dispersed phase droplets having an adsorbed layer of surface active molecules which, in a detergent solution, may be of soaps from hydrolysed fats or surface-active wetting agents. This adsorbed layer at the interface between the oil and the water has the function of increasing the adhesion between the two phases and thus reducing the amount of work which has to be done in creating the largely increased area of the interface between the two components of the emulsion. As the oil breaks up into smaller and smaller drops it will be obvious that the interface area is being greatly increased. Any charges on the droplets will also assist in the maintenance of the stability of the emulsion, since the droplets will carry similar charges and repel one another. Nevertheless, the primary factor would appear to be the reduction of interfacial tension by means of some surface-active material.

Micelle Formation

Another point worthy of notice at this juncture is that some of the oil or fat can dissolve in any soap micelles which may be formed as the result of saponification of the fats. A considerable amount of work has been done in recent years on this question of micelle formation, and it has been fairly well established by certain workers that this actually takes place.

The hydrophilic polar group of the soap molecule is regarded as lying on the periphery of a sphere, while the hydrophobic paraffinic part of the molecules is generally directed towards the centre of the sphere. It is then assumed that lyophilic molecules without any polar or hydrophilic groups can dissolve in the paraffin-like part of the soap molecule within the micelle.

Colloidal Activity and Deflocculation

A colloid is a non-settling suspension of finely divided particles which is a continuation of the simple solution system which finally terminates in discrete and flocculated particles. Naturally, all degrees exist between the true solution and the insoluble particle. Materials which have the ability to break up a solid mass into small particles and disperse them through the bulk of the solution are known as deflocculating agents. Efficient wetting of the solid is necessary to initiate deflocculation. Deflocculation or dispersion depends upon the solid particles tending to adhere to the liquid rather than to each other, and a lowering of the surface tension of the liquid tends to bring this about while the charge on the particles also assists this property. Solid particles precipitating from hard waters by alkalies can be prevented from depositing as scales if the detergent has good enough deflocculating properties.

Wetting Power and Wetting Agents

Many of the properties of a detergent solution depend in the first instance on its ability to wet the surface to be cleaned, hence the vital importance of this factor.

In considering the wetting power of an aqueous solution, it is necessary to take into consideration its surface tension, and, of course, interfacial tensions between either other liquids in which it is insoluble or other surfaces. Surface tension normally refers to the air-solution interfacial tension.

A liquid has internal cohesive forces which tend to minimise its surface area and the molecules in the surface layer have forces operating on three sides, whereas a molecule in the bulk of the solution has forces operating upon it in four directions. This will mean that at the surface there will be a force generally directed towards the interior of the solution because the pull of the molecules underneath the surface layer is not being balanced by any equivalent pull on the other side, and this force, which is measured in dynes per centimetre, is known as surface tension (γ in formulae).

There are a number of simple laboratory methods of measuring surface tension, and the easiest and commonest is the comparative method of the drop pipette, which is done by comparing a liquid of known surface tension with the one in which this quantity is unknown. A definite number of drops of the liquid are allowed to fall into a weighed bottle. Since the drops will all be of the same size for a given liquid, the total weight will naturally give the mass of each individual drop. The mass of each individual drop of a certain volume is definitely related to its surface tension because of

the reasons given above, and so by comparing the solution to be tested with a known one its surface tension can be arrived at by means of the formula,

$$\frac{\gamma_1}{\gamma_2} = \frac{M_1}{M_2}$$

where γ = surface tension, M = mass of drop.

A reduction of surface tension will enable the liquid to spread more readily over a surface covered with oil or grease by increasing the attraction of the solution for the grease-covered surface, or rather by reducing the repulsion between oil and water. Usually, solutions of low surface tension are obtained by the addition of soaps or similar surface-active substances, the molecules of which migrate to the surface of the solution and give the interface the low forces of an organic molecule, but, in addition, 1 per cent. solutions of the common detergent alkalies show surface tensions which differ rather from water. (See Table.)

Liquid silicate:	
Na_2O 1 : SiO_2 3·3	55·4
Na_2O 1 : SiO_2 2	62·2
Sodium metasilicate	64·4
Sodium orthosilicate	65·5
Caustic soda	68·5
Trisodium phosphate	63·49
Calgon	68·97
London tap water	70·87
Sodium oleate (soap)	29·11

Particularly of interest are solutions of sodium silicate in which the $Na_2O : SiO_2$ ratio is less than 1.

Soaps, *e.g.* sodium oleate, sodium stearate, and sodium palmitate, were the earliest wetting agents. The soaps suffer from the prime disadvantage of giving insoluble calcium and magnesium salts in hard water. Further disadvantages are the pronounced taste which traces of soap impart to any foodstuffs, and their very poor rinsing qualities.

Essential Properties of Wetting Agents

Wetting agents of other types are very numerous. At the outbreak of war there were roughly 300 different proprietary wetting agents on sale in the United States, and although the number on sale in this country was much less the list provided a wide choice. During the intervening years very many more have been added to the list. A substance, to have the property of reducing the interfacial tensions at the surfaces formed by an aqueous solution, must have two essentials: (1) an alkyl or fatty chain or aryl-alkyl chain the total carbon content of which usually lies between 9 and 20 atoms, and (2) a strongly polar group, or at any rate a polar group or groups. A necessary qualification must be added—that is, that the compound shall have some degree of solubility in water. Sometimes this is only slight, but the solution thus obtained will still show low surface and interfacial tensions. Usually the polar group in simple wetting agents consists of the group SO_2ONa, which may be attached to the rest of the molecule through an oxygen atom which brings it into the ester class, or may be attached directly to a carbon atom which makes it a sulphonate.

Sulphates and Sulphonates

The other polar group usually found is an amine group, but these are comparatively few and are confined to special applications. By far the greater majority of wetting agents are sulphates or sulphonates. These wetting agents function by imparting to the surface layers of their aqueous solutions the characteristics of the paraffinic chain rather than that of water, and this is achieved by the soluble or polar group being actually located in the water molecules while the paraffinic chain overlays the water molecules. Hence, the true water surface is overlaid by closely packed paraffinic chains which naturally, as they have much lower attraction for each other, superimpose a lower surface tension. The type most commonly met with in detergency is the sulphated fatty alcohol wetting agent. A simple instance of this type may be obtained from the treatment of lauryl alcohol (dodecyl alcohol) with concentrated sulphuric acid and the subsequent neutralisation of the reaction mixture (after dilution) with caustic soda. The reaction has brought about the esterification of sulphuric acid with the lauryl alcohol, the neutralisation merely producing the well-known sodium lauryl sulphate. The sulphated fatty alcohols, therefore, must be regarded as esters, and these will tend to hydrolyse on prolonged boiling with alkalies and on heating for a relatively short time with dilute acids. Nevertheless, for all practical detergency work they may be regarded as stable, and on account of their relative cheapness they are the most reasonable substances to use. Unlike the soaps, mentioned above, they do not tend to leave behind any unpleasant flavours, and this may be to some degree attributed to their good rinsing qualities, a fact which Liddiard and Harwood (*vide infra*) observed. This class of substance is often compounded with alkaline materials and can be used for many purposes in food factories, but not in jetting-type bottle-washing machines where the degree of foaming would be so great as to convert the whole of the solution into foam in a very short space of time. Another group of some interest are the polyglyceryl esters where, instead of a strong polar acidic group such as a sulphate or a sulphonate, the hydrophilic group consists of alcoholic hydroxyls arranged as in glycerol, but once again a long alkyl chain is attached to provide the neces-

sary hydrophobic paraffinic chain. Other common varieties are benzene or naphthalene sulphonic acids, which contain as a substituent one or more alkyl chains. This type is the true sulphonate where the sulphur atom is attached directly to a carbon atom, and this type of wetting agent cannot be hydrolysed either by acids or dilute alkalies.

Alkaline solutions which show comparatively low surface tensions of about 50 dynes as compared with water at 72 can be obtained in carefully blended detergents and without introducing the unpleasant property of foaming.

Physical Factors in Foaming

One of the difficulties occasionally met in food container and bottle-washing machines of the hydro- or jetting-type is excessive foaming. Naturally a reduced air-solution interfacial tension will tend to produce a foam, but if this foam has only a momentary existence it will not have much practical significance. The factors which make for stable foams are additional to the surface tension factor. N. K. Adam (*The Physics and Chemistry of Surfaces*) points out that low surface tension is not the main requisite so much as that the solution should have a surface tension quickly and easily variable. When a foam is created the air-solution interface has a very much greater area than in the solution before the creation of the foam, consequently, in the case of wetting agents, the rate of adsorption of the molecules into the newly created surfaces is of importance. Where this rate of adsorption is low, any cause of foaming (such as violent agitation) will not produce more than a certain amount of foam in a given time, whereas a wetting agent which has a more rapid rate of adsorption will produce more foam in the same time. The stabllity of a foam decides whether the bubbles created by the jet expansion and pump turbulence shall burst rapidly or persist and accumulate. Stability in turn depends on viscosity, bubble size, drainage rate, permeability to gas, and other conditions.

The Purpose of Wetting Agents

The purpose of wetting agents, as their name implies, is to bring about rapid wetting of surfaces by solutions in which these substances are solutes. N. K. Adam (*loc. cit.*) suggests that the simplest definition of wetting can be obtained from the relative adhesions between the liquid for the solid and the liquid for itself—data given by the measurement of the angle of contact of the solution on the solid or surface. The greater the angle, the poorer the wetting. A spreading coefficient E, which gives the ability of a given liquid to spread on a given surface, is given by the following formula:

$$E = \gamma (\text{Cos}.\theta - 1),$$

θ being the advancing contact angle.

In order for the liquid to spread on the solid surface the attraction of the solid surface for the liquid must be greater than the attraction of the liquid for itself.

Cleaning problems appear to involve this principle in two ways. Firstly, the cleaning solution must be able to spread on and "wet" the deposit to be removed. The wetting of the deposit will assist penetration and bring the cleaning properties of the detergent into operation, but here the attraction of the underlying surface for the unwanted deposit must play a part, and, further, this will vary according to the material of which it is made and the physical condition of the surface. Thus, for a given deposit removal must vary in ease according to the variations in surface-free energy of the utensils to be cleaned, depending whether they are glass, steel, tin, or aluminium. Precise information on this point is lacking, but should provide matter for future investigation.

Sterilising Power

The question of the wetting power of a detergent solution has apparently an effect upon its sterilising power. It has long been known, for instance, that in any disinfectant series (for example the phenols) that substance which lowers the surface tension of water most will be found to have the greatest bactericidal power.

The germicidal action of the strong alkalies is well known, and this action can evidently be increased by the lowering of surface tension (Bayliss, Wilson, and Ordal. U.S.P. 2,183,038) by means of an alkyl sulphate wetting agent. Therefore, detergents should yield a cleaning solution with as low a surface tension as possible.

A real advance is now being made in the production of carefully balanced detergents which have the desirable qualities of high wetting, emulsifying, deflocculating, and rinsing powers combined with the requisite degree of water softening, alkalinity, and buffering.

Rinsing

It is absolutely important that the detergent which has amongst its other desirable properties that of being easily removed from the surface and is cleaned by rinsing water. At first sight it might appear that this is a trivial matter and that any water-soluble substance will be easily removed in this way. Experience and experiment show this not to be the case, and it is now generally realised that there are considerable variations in the rinsing properties of the common detergent alkalies.

It has been known for a very long time that

caustic soda is difficult to rinse from glass surfaces, and this was evident from the fact that such a surface often showed a fine white film on drying after rinsing. Now it is a fact that if a film of detergent deposit remains after the operation it may contain emulsified residues of the detergency stage and these may well contain bacteria and other organisms. In addition to this, no one engaged in the scientific production of food likes a film of detergent residue remaining after the cleaning operation.

Rinsing Power of Alkalies

Until recently, no accurate data had been accumulated on this question of rinsability, earlier workers having used a titration method when concerned with the rinsing properties of alkalies. Their results had been subject to errors, which in general invalidated the figures obtained. Recently, however, Liddiard and Harwood investigated the rinsing of alkalies and other detergents from glass surfaces by means of a conductivity method. These workers found that the following detergent alkalies could be placed in this order for excellence of rinsing:

(1) Liquid silicate with an $Na_2O:SiO_2$ ratio of 1 to 3·3.
(2) Liquid silicate $Na_2O:SiO_2$ ratio of 1 to 2.
(3) Trisodium phosphate.
(4) Sodium carbonate.
(5) Sodium metasilicate.
(6) Disodium phosphate.
(7) Sodium orthosilicate.
(8) Caustic soda.

They also conducted a series of experiments adding 1 per cent. of various alkalies to caustic soda to see which would best improve its rinsing properties. These experiments revealed that the addition of 1 per cent. of sodium hexametaphosphate to caustic soda improved the rinsing qualities of that alkali to a very considerable extent. For this reason sodium hexametaphosphate must be considered as having a dual purpose in detergency. It is well known for its advertised property of sequestration of calcium or bivalent metal ions; to this can now be added the very valuable property of improving the rinsing qualities of a detergent. The rinsing experiments would not have been complete without some examination of organic detergents, and the first of these to be considered was sodium oleate, a common soap. It was fully expected from practical experience that this substance would be very poor, and this was actually found to be the case. When added to caustic soda it rendered the already poor rinsing qualities of that substance even worse. In opposition to this the addition of 1 per cent. of an organic wetting agent of the sodium alkyl sulphate type vastly improved the rinsing of the caustic soda. By themselves this latter class actually rinse quite readily.

Dairy Refrigeration

Some forty members and guests of the Dairy and Ice Cream Equipment Association attended a Dinner Meeting on Wednesday, March 26, during which Mr. A. Graham Enock, a past President of the Association, gave a talk on "Refrigeration in the Dairy and Allied Industries." Mr. Enock reviewed the methods of cooling applied to milk and the different methods of milk pasteurisation. Great advances had been made in the cooling of milk in the dairy. Whereas forty years ago the supreme test for cooling milk was often to dip the thumb into the trough of the open-type milk cooler, today, while this cannot be done due to the enclosing of the milk in the plant, the practice of human assessment of temperature is still all too often continued by feeling the temperature of the outflow pipe through which the milk passes on its way to the filling machine.

Mr. Enock summarised the developments that had taken place in the cooling of milk. Today, self-contained all-metal air cooling units operating on brine or ammonia direct and equipped with rapid air circulating systems were extensively used, and dairy cold storage rooms equipped with automatic temperature control arrangements.

Turning to the cooling of ice cream mix, Mr. Enock said that it required very much the same equipment as for milk although used on a smaller scale. He discussed batch freezers and also large-scale continuous freezing.

Future Developments

Continuing his talk, Mr. Enock dealt with possible future developments. He felt that refrigeration in the dairy should be less obtrusive and more self-contained and applied in the simplest way. He believed that the average dairyman wished to regard his refrigeration as he did his water supply—namely, as something that was always available by just opening a single valve. More attention might be given to the economical side of the application of dairy refrigeration. So far as the major duty of milk cooling was concerned, tremendous wastage of power and water took place due to plants not always operating efficiently. While this was frequently due to carelessness or ignorance it was often partly due to the fact that the plant was not designed to take care of a varying load. Further developments might well continue, therefore, for providing simple means of balancing automatically the output of the compressor to the varying duties it is called upon to perform.

Research might also be made into the possibilities of the rapid chilling of milk in the bottle.

"In-bottle" pasteurisation had been accepted by most people as being an ideal method, and if means could be found for cooling the milk in eight to ten minutes and the H.T.S.T. system or some equivalent formula for effectively heat-treating the milk were employed, the present accepted ideas of bulk cooling might undergo a radical change.

Mr. Enock concluded his paper by alluding to the possibilities of quick freezing milk in cartons. He also referred to the foundation of a National Dairy Technological Institute the establishment of which was being studied by the D.I.C.E.A. and other Associations.

Mr. Arthur G. Enock Praises "In-bottle" Pasteurisation

Opening the discussion that followed, Mr. Arthur Guy Enock made a forceful contribution to the proceedings. He sketched the developments of compressors from the earliest times to the present day. Mr. Enock was well qualified to discuss this subject as he played a large part in the evolution of a safe and efficient compressor. It was when discussing "in-bottle" pasteurisation that Mr. Enock rose to heights of eloquence. With humorous side glances to those engineers interested in H.T.S.T. he sang the praises of the "in-bottle" process. There were difficulties, he admitted, but they were only of such a nature as were capable of being overcome; in fact, the difficulties were over-emphasised. It was an anomaly to pasteurise milk, pour it into bottles that were not bacteriologically clean, allow pathogenic and other bacteria to drop in before capping, when it was possible to have a milk delivered to the consumer with all bacteria absent that mattered. Among others that contributed to the discussion were Messrs. Farnorth, Cianfarani, Leno, and Taylor. A vote of thanks proposed by Professor Kay was seconded by Mr. Norman Neville.

Mould Bran

LABORATORY methods for growing the mould *A. Oryzae* on moist, sterilised wheat bran for the production of a low-cost enzyme product, mould bran, have involved growth in a rotating drum, growth on trays in specially humidified and ventilated incubators, and growth in thick layers in a covered pan having a perforated bottom for forced aëration through the bran mass (*Cereal Chemistry*, **24**, 21). Thorough sterilisation of the moist bran, which can best be effected by using dilute acid and heating with steam, and a period of quiescence during the early growth phases have been found essential for the production of mould bran of highest amylolytic power, and the pan method of incubation was preferred for laboratory work. An efficient method for the production of laboratory spore cultures to serve as inoculum has also been developed.

Pilot Plant Investigation

Pilot plant investigations led to the solution of the main problems in translating laboratory results to commercial production. A cooker was developed for the sterilisation, involving a covered mixer with direct steam injection. The sterilised bran was also cooled in the mixer by means of an air stream, and was inoculated in the mixer by blowing dry spore culture into the mixer. It was found that mycelium inoculation was possible, but spore inoculation was preferable, a ratio as small as 0·04 per cent. of dry spore culture giving as good results as higher inoculum ratios. Spore cultures for inoculum were best prepared on a large scale by the use of covered pans through which was circulated just enough air to provide for the metabolic requirements of the mould.

Pilot plant investigations of methods of incubation involved growth on trays and in cells with forced aeration. The tray method was simpler, but no satisfactory method of handling the large tray area required for commercial operation was devised during the pilot plant research. A pilot plant method involving the use of either vertical or inclined cells having hardware cloth faces so that air could be forced through the bran was developed. With an initial moisture content of about 51 per cent., most rapid mould growth occurred between 32° C. and 38° C. The temperature was controlled by varying the rate of air flow through the bran layer by increasing the pressure as required. Two-stage incubation gave somewhat better mould bran than incubation for the entire period in a single cell.

Semi-Commercial Production

Semi-commercial production of mould bran in two units showed that a unit involving incubation on swinging trays in a specially ventilated room was easier to operate and gave a more uniform product than a unit designed in accordance with the pilot plant method using cells. Optimum conditions of moisture content, nutrient requirements, temperature range, air requirements, incubation time, and the like, ascertained during the pilot plant research with cells hold equally for the process using the swinging trays. A commercial plant processing 10 tons of bran per day is now in successful operation.

Large-scale uses for mould bran have developed in saccharifying grain and potato mashes for the alcoholic fermentation and in saccharifying grain for the production of enzyme-converted syrups.

Protein Hydrolysates

L. M. SPALTON, B.Pharm. (London), M.P.S.

The treatment of protein depletion by administration of protein hydrolysates has been successfully demonstrated in many cases during the last ten years. The treatment of severe starvation with these preparations received especial publicity during the Bengal famine of 1943 and at Belsen and other concentration camps after the liberation of Europe. In this article, the manufacture of protein hydrolysates is described and the problems of their future development are reviewed.

THERE are twenty-two or more amino acids, and ten of these are considered as essential for human needs.[1] The remaining amino acids are utilised if present in the diet, but if absent can probably be synthesised by the body from other amino acids.

Essential Amino Acids.	*Non-essential Amino Acids.*
Arginine	Alanine
Histidine	Aspartic acid
Isoleucine	Citrulline
Leucine	Cystine
Lysine	Glutamic acid
Methionine	Glycine
Phenylalanine	Hydroxyglutamic acid
Threonine	Hydroxyproline
Tryptophane	Norleucine
Valine	Proline
	Serine
	Tyrosine

It is a comparatively simple matter to hydrolyse food protein *in vitro*, and it should therefore be possible to provide the clinician with a source of amino acids which could be administered by vein. Working on this assumption, Elman and Weiner[2] in 1938 utilised an acid hydrolysate of casein as a means of intravenous alimentation in human subjects. Since then protein hydrolysates have been used as a means of oral and parenteral feeding in a wide variety of clinical conditions.

Production of Protein Hydrolysates

Protein hydrolysates have been prepared from casein, blood, lactalbumin, bovine serum albumin, skimmed milk, and from the proteins of soya bean, liver, meat, fish, and wheat. So far casein and meat hydrolysates appear to have been the most successful, presumably because they contain the greatest concentration of the essential amino acids.

The extent of hydrolysis is important, and is indicated by the ratio

$$\frac{\alpha\text{-amino-nitrogen}}{\alpha\text{-amino-nitrogen on complete hydrolysis}}$$

Complete hydrolysis is obtained by boiling the product with concentrated acid. The difference between the α-amino-nitrogen originally present and the α-amino-nitrogen available on complete hydrolysis is representative of polypeptide nitrogen. The difference between total nitrogen and α-amino-nitrogen on complete hydrolysis is indicative of imino and ring nitrogen, probably together with amide nitrogen. The biuret test is not a satisfactory method of determining complete hydrolysis, since histidine, serine, and threonine give positive biuret reactions. Freezing-point data will give some indication of the extent of breakdown in a protein hydrolysate.

Hydrolysis may be conveniently achieved by alkalies, acids, or proteolytic enzymes. The use of certain wetting agents has also been reported and would seem worthy of further investigation.[3]

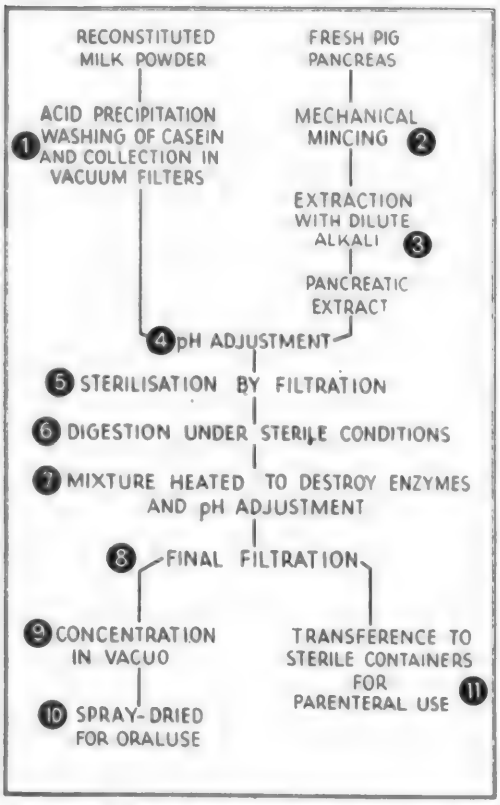
Hydrolysis with Alkalies

Hydrolysis with sodium hydroxide, potassium hydroxide or barium hydroxide is rapid and complete, but, unfortunately, racemisation of the amino acids occurs. Since only the *laevo*-amino acids are biologically utilised, alkaline hydrolysis is a wasteful method and unlikely to be of importance. Further, there is destruction of cystine and some ammonia formation, with consequent destruction of amino acids by deamination.

Hydrolysis with Acids

Hydrolysis with acids does not racemise the amino acids to any appreciable extent, but there is quantitative destruction of tryptophane. Many acids have been used to hydrolyse proteins, including hydrochloric, sulphuric, hydrofluoric, hydrobromic, hydriodic, formic, phosphoric, oxalic, and

[α]



Flow-sheet showing the stages in the production of an enzymic casein hydrolysate.

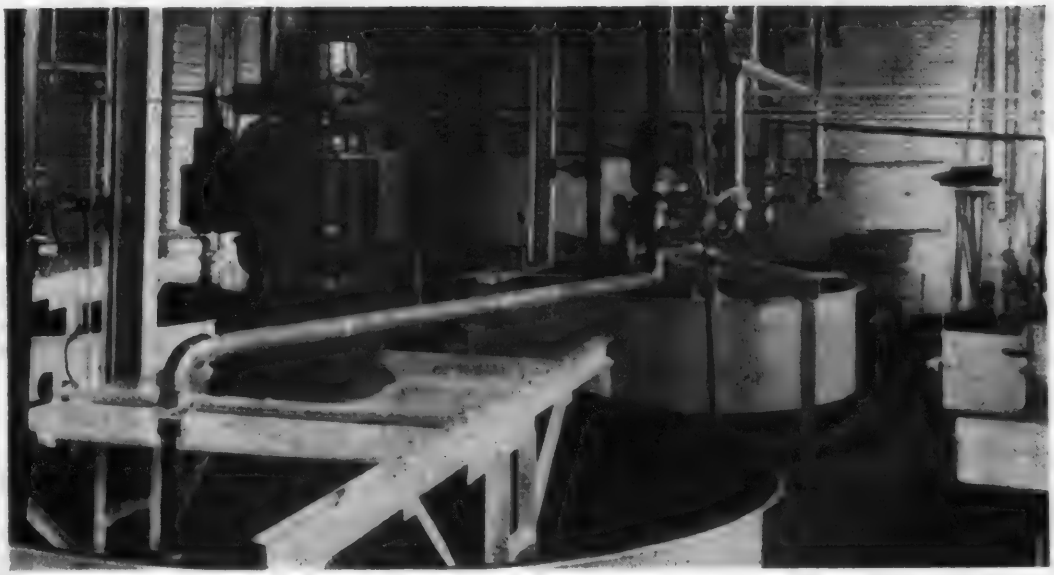
acetic acids, but of these, hydrochloric and sulphuric are preferred. Acid hydrolysis of food protein was first performed by Braconnot[4] in 1820, and his method is still common procedure. Sulphuric acid (about 8 N) is mixed with protein, and the mixture heated for twenty-four hours or until hydrolysis is complete. An equivalent quantity of baryta is added, and the barium sulphate filtered off. The solution is then treated with charcoal to remove the humin which forms during hydrolysis. Humin is a brown or blackish substance which is probably a condensation product of tryptophane with an aldehyde.

Acid hydrolysates should be fortified with suitable quantities of tryptophane. Sahyun[5] has described a method of acid hydrolysis under pressure. Casein is autoclaved with 5 N sulphuric acid at 15 lb. per sq. in. for sixteen hours. The product is cooled and treated with slaked lime until the reaction is *p*H 10·0. The mixture is diluted and the calcium sulphate removed by filtration. The acid hydrolysate is concentrated *in vacuo* and the calcium ions removed by saturating with carbon dioxide, and finally by adding oxalic acid. Sulphate is removed by baryta, and the product concentrated to the desired volume. The resulting acid hydrolysate is stated to be tryptophane-free and to have an $\frac{\alpha\text{-amino-nitrogen}}{\text{total nitrogen}}$ ratio of 82. Synthetic tryptophane is added, and the product is clarified and sterilised by filtration. The fact that tryptophane is liberated and, therefore, destroyed in the final stage of hydrolysis forms the basis of a new method which was developed by White and Elman.[6] Casein was hydrolysed with 2·6 N sulphuric acid for six hours. This produced 60 per cent. liberation of the total amino-nitrogen, but only 15 per cent. destruction of the tryptophane.

Hydrolysis with Enzymes

Hydrolysis with proteolytic enzymes proceeds in definite stages, viz.: Protein→proteoses→peptones→peptides→amino acids. The enzymes generally used are papain, derived from the latex of *Carica papaya*, and trypsin, usually in the form of fresh pig pancreas or pancreatic extracts. The

Pig pancreas is used, collected as fresh as possible from the abattoirs, passed through a mechanical mincer, and extracted by vigorous shaking with dilute alkali for several hours.



Preparation of purified casein. Milk powder is reconstituted in the vats shown, each capable of dealing with 4,000 gallons of milk per charge.

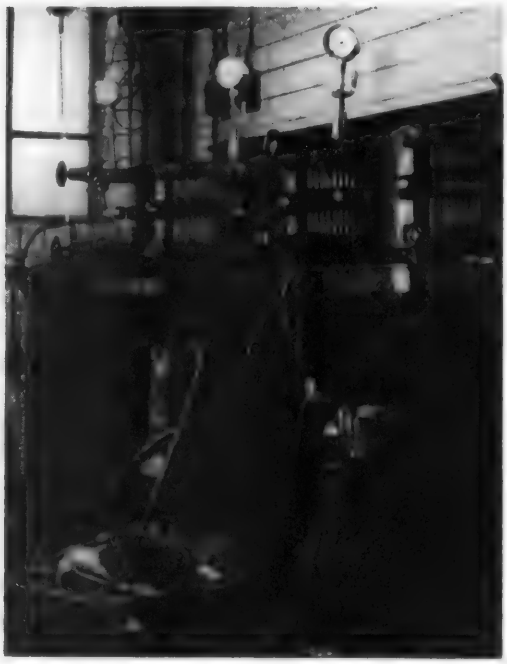
process is mild, and there is no destruction or racemisation of amino acids. Of the three methods cited, enzymic hydrolysis is the most closely allied to the natural digestion of food protein. On the other hand, the process requires eight to twelve days, while acid hydrolysis requires only six to twenty-four hours, and it is necessary to maintain sterile conditions during the digestion.

The following is a description of the production of an enzymic casein hydrolysate: High-grade acid-precipitated casein is mixed with an alkaline extract of pancreas, and the mixture sterilised by filtration. The mixture is incubated and digestion takes from eight to twelve days. When the required degree of hydrolysis is reached the mixture is heated to destroy the enzymes, the *p*H is adjusted, and the solution clarified by the addition of activated charcoal and subsequent filtration. The clear solution is concentrated *in vacuo* and spray-dried. If a solution for injection is required, the *p*H is adjusted to 6·5 and the product is sterilised by filtration or by autoclaving. Filtration is to be preferred, since heat sterilisation tends to accelerate tyrosine precipitation. Papain digestion has also been used, but has been criticised because the digestion does not proceed to the amino acid stage.

In assessing the relative value of acid and enzymic hydrolysates as sources of assimilable nitrogen the nutritive value of peptides as compared with that of individual amino acids must be considered. Madden and Whipple[7] have expressed the opinion that simple peptides are absorbed as such. Recently Woolley[8] has shown that mice fed on an acid hydrolysate of casein fortified with tryptophane and cystine grow at a suboptimal rate, and that the absence from the diet of a peptide, strepogenin, was responsible for this phenomenon. Albanese and Franston[9] have shown that rats grow more quickly when fed on an enzymic digest of casein than when fed on a mixture of all known amino acids. As proteins need not be broken down into the amino acid stage to avoid immunological activity, the biological evidence would seem to favour the use of an enzymic rather than an acid protein hydrolysate.

Forms of Hydrolysates in Use

Acid and enzymic hydrolysates are issued by the manufacturer in two forms: as spray-dried or roller-dried powders for oral administration and as sterile apyrogenic solutions for parenteral administration. The oral varieties are available as buff or pale brown hygroscopic powders, which are soluble in warm water to form yellow or brown solutions. Some manufacturers flavour their product with lemon, peppermint, or glucose in an endeavour to mask the unpleasant taste. A Swedish manufacturer issues a casein hydrolysate primarily designed for feeding premature infants, which is prepared by enzymic digestion and subsequent dialysis of the amino acids. Protein hydrolysates



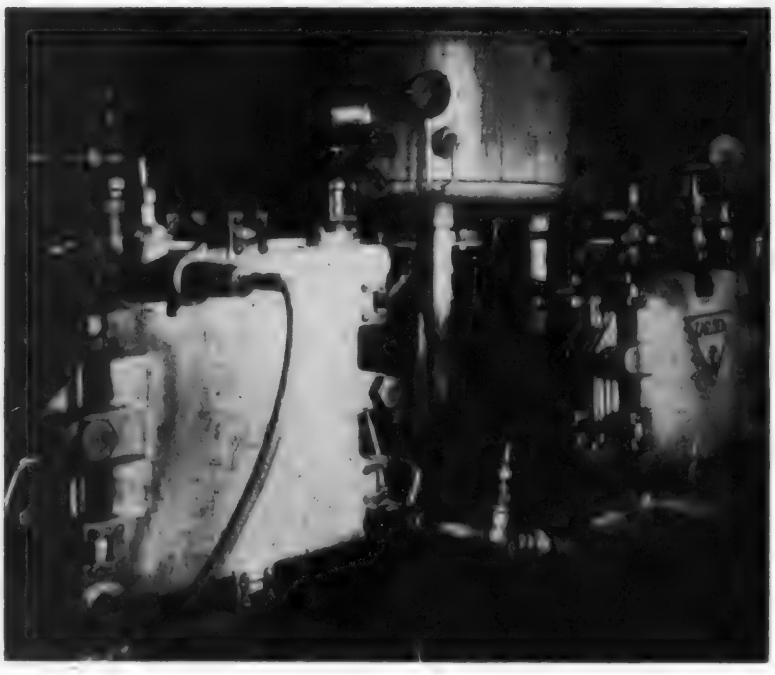
Sterilising filters for filtration of the final product. The material has undergone digestion and has been heated to destroy the enzymes.

designed for oral administration are sometimes administered post-operatively by surgical tube feeding. Frequently, because of the objectionable taste, they have been administered by gastric tube. Rectal feeding[10] has been reported, but has been criticised[11] because of the variability of absorption by this route.

For parenteral administration protein hydrolysates are usually issued as sterile 5 per cent solutions, with or without added glucose. The inclusion of glucose is of value to the physician, since in certain cases if glucose and protein hydrolysates are fed separately, the fluid intake may be larger than is desirable. Basu and Ray[12] claim that, on storage, protein hydrolysate solutions which contain glucose may lose their tryptophane content and darken in colour, presumably due to humin formation. Protein hydrolysates are normally administered intravenously, but have been administered by subcutaneous,[13] and intraperitoneal[14] injection, and by transfusion into the bone marrow of the sternum[15] and long bones.

Pharmacological Testing of Protein Hydrolysates

In considering the biological value of a protein hydrolysate the concept of nitrogen balance is of importance. An animal is in nitrogen balance when the nitrogen intake equals or exceeds the amount of nitrogen eliminated via the urine and faeces. Thus in young animals where growth is taking place the nitrogen intake is positive; but in starvation and wasting diseases a negative nitrogen balance occurs. The primary criterion of the biological value of a protein hydrolysate must be its ability to maintain nitrogen balance in humans when fed as the sole source of nitrogen. Further, it must be shown that the protein hydrolysate will produce regeneration of plasma protein in depleted animal and human subjects. An important test is the ability of the product to support normal growth in immature rats when fed as the sole source of nitrogen, and the preparation of such growth curves in rats is routine procedure in estimating the biological value of any protein or protein product.



Large sterilising filters used in filtration of mixture prior to digestion.

The sodium chloride content must be carefully controlled and made known to the clinician to aid him in his calculation of the electrolyte requirement of the patient. The reaction of the final solution should be as near to 7·0 as possible in order to avoid the danger of acidosis if large volumes are injected. Antigenic reactions from protein hydrolysates have been recorded,[16] and tests for the occurrence of anaphylactogens are performed by the injection of samples into guinea-pigs. Freedom from histamine-like substances, which have been reported present in some samples,[17] and undue toxicity, may be determined by injecting samples intravenously into anaesthetised cats and studying, manometrically, changes in the carotid blood pressure.[18] Pyrogen tests should be carried out by the rabbit test of U.S.P. XII; this is most important, for the exclusion of pyrogenic activity is one of the great difficulties in the production of a satisfactory protein hydrolysate.

Tests for sterility on protein hydrolysate solutions are performed by incubation of the final product. Protein hydrolysates are excellent media for the growth of bacteria, and any contamination will soon become apparent. Stored samples should be watched for tyrosine precipitation, leucine-isoleucine precipitation, and humin formation. The usual precipitation tests with salt solutions, mineral acid, trichloracetic, picric, phosphotungstic, and phosphomolybdic acids can be performed, or the Millon and xanthoproteic colour tests. Protein hydrolysates for oral use are usually submitted to tests for toxicity and bacteriological tests to ensure a low standard plate count and freedom from haemolytic streptococci and *B. coli*. Where a product is intended for the treatment of peptic ulcer, tests of its buffering activity seem necessary.

Treatment of Famine Victims

Logically, protein hydrolysates would seem to be indicated for the treatment of severe starvation. In the Bengal famine[19] of 1943 the use of protein hydrolysates, which were prepared locally, produced gratifying results. During the liberation of Europe casein hydrolysates were used to treat starvation cases in Holland[20] and at Belsen[21] with less satisfactory results. The buffering action of amino acids is well known, and *in vivo* tests[22] have shown that protein hydrolysates are effective in reducing gastric acidity.

When the quantitative requirements of individual amino acids in man are known, it should be possible, by using mixtures of proteins, controlled hydrolysis, and where necessary fortification with synthetic amino acids, to produce a protein hydrolysate which will supply all the nitrogen requirements of the body in a highly concentrated form.

REFERENCES

1 Rose, W. C., *Physiol. Rev.*, 1938, **18**, 109.
2 *J.A.M.A.*, 1939, **112**, 796.
3 Steinhardt, J. V., and Fugitt, C. H., *J. Res. Nat. Bureau Standards*, 1942, **29**, 315.
4 *Ann. Clin. Phys.*, 1820, **13**, 2113.
5 "Outline of the Amino Acids and Proteins," New York, 1944.
6 *J. Biol. Chem.*, 1942, **143**, 798.
7 *Physiol. Rev.*, 1940, **20**, 194.
8 *J. Biol. Chem.*, 1945, **159**, 753; *ibid.*, 1946, **162**, 383.
9 *Bull. Johns Hopkins Hospital*, 1945, **77**, 61.
10 Alberhalden, E., *et al.*, *Z. f. Physiol. Chem.*, 1909, **63**, 215; Griesbach, W., *Klin. Wchnschr.*, 1922, **2**, 1926; McClendon, J. F., *et al.*, *J. Lab. and Clin. Med.*, 1939, **22**, 1000.
11 McLester, J. S., "Nutrition and Diet in Health and Disease," Philadelphia, 1943.
12 *Pharm J.*, 1946, **157**, 151.
13 Wilensky, A. O., *Surg. Gynec. Obst.*, 1945, **80**, 323.
14 Hartmann, A. F., *et al.*, *J. Pediat.*, 1944, **24**, 371.
15 Altschuler, S. S., *et al.*, *J.A.M.A.*, 1943, **121**, 163.
16 Elman, R., *et al.*, *Ann. Surg.*, 1942, **115**, 1160.
17 Hopps, H. C., and Campbell, J. A., *J. Lab. and Clin. Med.*, 1943, **28**, 1203.
18 Mukerji, B., *Pharm. J.*, 1945, **155**, 65.
19 Krishnan, K. V., *et. al.*, *Indian Med. Gaz.*, 1944, **79**, 160; Narayanan, E. K., and Krishnan, K. V., *ibid.*, 1944, **79**, 158.
20 Burger, G. C. E., Sandstead, H. R., and Drummond, J., *Lancet*, 1945, **2**, 282.
21 Lipscomb, F. M., *Lancet*, 1945, **2**, 313.
22 Levy, J. S., and Silver, K. A., *Amer. J. Digest. Dis.*, 1942, **9**, 354.

Acknowledgments.—All photographs in this article are reproduced by courtesy of Genatosan, Ltd., by arrangement with Genaben Ltd.

Safe Shell-Fish

"A WERY remarkable circumstance—that poverty and oysters always seem to go together," commented Sam Weller on conditions in London nearly one hundred years ago.

Taking the above as the starting-point for his discussion, H. P. Sherwood, B.A., Senior Naturalist on the staff of the Ministry of Agriculture and Fisheries, in his booklet* traces the history of the oyster since it was first consumed, down to conditions existing at the present time.

Although only a small publication, the author deals with public oyster fisheries, other shell-fish, sewage pollution and how its dangers may be assessed, remedies for pollution, and approved purification. A pictorial supplement shows the treatment of mussels at the Conway purification station.

For public health authorities and all others interested either in the consumption or the production of shell-fish, the booklet should prove invaluable.

* *Safe Shell-Fish.* By H. P. Sherwood, B.A. Pp. 13. London.

The Ice Cream Industry

NECESSITATED by the progress made in methods of ice cream manufacture and distribution and also in dairy engineering, bacteriology, and the use of new ingredients, one of the most comprehensive textbooks* on the ice cream industry appears at an opportune moment for British ice cream manufacturers. As the trend in Britain is steadily towards American methods, this book, which analyses the industry through American eyes, promises to become more and more valuable to British manufacturers as the years pass, although its service to them at the present time is considerable.

The authors deal with possible combinations of milk-fat and milk-solids-not-fat in basic mixes, a subject of much importance to British manufacturers at present when statutory chemical standards are receiving consideration by the Ministry of Food as well as by the two trade organisations. The Ministry of Food, which views the standard primarily from the standpoint of nutrition in the national interest, has expressed the opinion that milk-solids-not-fat is more important than milk-fat, because the national diet is deficient in "serum solids," as they are called, and ice cream is the ideal medium for making them available to the public.

Every ice cream manufacturer knows that the quantity of serum solids that can be used in a mix is limited, and that sandiness develops if the limit is exceeded. He also knows that the quantity of serum solids that can be used varies inversely with the quantity of fat. If the Ministry's desire for maximum serum solids is to be satisfied, obviously the fat content must be kept down; but if manufacturers are to give the public a product that will keep well and will be satisfactory for use in bricks and briquettes a high fat content is desirable. Compromise between official theory and commercial practice seems to be the ultimate solution.

A typical pre-war commercial mix of the larger British manufacturers was as follows:

Milk-fat	10
Milk-solids-not-fat	11
Sugar	13·5
Gelatin	0·5
Total solids	35·0

* *The Ice Cream Industry*. By G. D. Turnbow, P. H. Tracy, Ph.D., and L. A. Raffetto. Pp. 654. New York and London. Price 36s. net.

The American authors publish a table of formulae in which the milk-fat content rises from 4 per cent. to 16 per cent., while the serum solids content falls from 15 per cent. to 9 per cent. The table comprises ten formulae in which the stabiliser content (225 Bloom gelatin) falls from 0·5 per cent. to 0·3 per cent. as the fat content rises. The sugar content varies from 13 per cent. to 15 per cent., but with no apparent relation to any other ingredient.

In America, the authors state, ice cream containing 4 per cent. milk-fat, 15 per cent. milk-solids-not-fat, and 14 per cent. sugar is commonly used in milk shakes and malted milk drinks. There is a strong case in Britain for the manufacture of ice cream to special recipes for use in such drinks, though at present comparatively few milk bars adopt such a practice, partly because of the shortage of milk for milk shakes. A point that will have to be determined in connexion with the standard is whether ice cream used in beverages must conform to the minimum standard prescribed by the Ministry.

There is a difference in the sources of milk solids used by ice cream manufacturers in Britain and America. Here fresh cream has always been a "luxury," and consequently the milk-fat used by the industry was usually reconstituted from butter before the war. Skimmed milk powder was usually the source of the milk-solids-not-fat. In short, British ice cream manufacturers could "make" milk cheaper than they could buy the fresh commodity from the Milk Marketing Board.

In America, milk solids and milk-solids-not-fat always include a large proportion of fresh (or frozen) cream and fresh milk. In reading formulae in American textbooks, therefore, it is always necessary for British manufacturers to translate these items into ingredients available to them.

Continuous Freezing

The new edition contains a valuable new chapter on the operation of the continuous freezer. This is regarded as the machine of the future in Britain. It is the machine of today in America. More than one firm has begun the manufacture of continuous freezers in this country since the war. The authors state that among the advantages claimed for continuous freezers over batch freezers are:

(1) Ice cream can be drawn from the freezer at lower temperatures, so that a smoother texture is obtained.

(2) Whipping problems are minimised as air is incorporated under pressure, thus making it possible to obtain any desired overrun.

(3) Much less floor space is needed than is required for batch freezers.

(4) Packages can be filled direct from the freezer.

(5) It is not necessary to age the mix before freezing.

"The acceptance of the continuous freezer has become so universal that practically all the large manufacturers and a large percentage of the small ones use this method," state the authors.

"In some of our large cities over 90 per cent. of the ice cream sold is made in continuous freezers. It has been estimated that in 1940 from one-half to two-thirds of the total ice cream output of America was made in continuous freezers."

It must be borne in mind that in America a manufacturer whose output is 500,000 gals. a year is a small manufacturer!

This chapter gives the history of the continuous freezer and describes in detail the mechanism of two of the leading machines of this type. The preparation of mixes for use in continuous freezers is also dealt with.

These freezers have made possible the introduction of "ripple" or "ribbon" ice cream, which has proved popular in America. Its adoption in Britain awaits the more general use of the continuous freezer.

The Choice of Flavour

Flavouring also has a special chapter. Although most American manufacturers carry a wider variety of flavours than do British ice cream makers, vanilla, chocolate, and strawberry flavours comprise about 80 per cent. to 85 per cent. of the total ice cream sales in America. In this country these flavours comprise at least as high a proportion of the output.

Vanilla is the leading flavour, and the authors have given considerable space to it. They deal with the classification of vanilla beans production of the extract, and concentrated vanilla flavours. Artificial vanilla flavours are also discussed at length.

Frozen fruits are believed to have a future in the ice cream industry. The authors deal with these products, the manufacture of which is already making considerable progress in Great Britain.

Hygienic Control

America is generally considered to be ahead of Britain in the hygienic control of ice cream manufacture, particularly in the storage of dry ingredients. The authors deal extensively with the sanitary control of ice cream plants. Bacterial standards in the various states are mentioned. Another informative chapter is devoted to washing and sterilising; this will help ice cream manufacturers and their staffs to obtain a proper understanding of the cleansing operations involved, a sound knowledge of the properties of washing powders and sterilising agents, and the principles governing their use.

Ice Cream Recipes

Recipes for ice cream are handled by the authors according to the following classification: plain, fruit, nut, confection and *bisque* ice cream, pudding, *parfaits*, *mousse*, and custard. Some of them make tantalising reading for Britons at the present time. Thus, under the heading of "plain ice creams" is the following "Delmonico:"

40 lb. of 25 per cent. cream.
2 doz. eggs (whipped and pasteurised with mix).
8 lb. sugar.
3 oz. gelatin.
Vanilla to suit.

Ice cream has no legal definition in Great Britain. The authors define it as follows:

> "A whipped and frozen food made from such a mixture of dairy products as will give the desired percentages of milk-fat and milk-solids-not-fat, together with sugar, flavouring, colouring, often egg products, and usually a stabiliser."

There are recipes for toppings of many flavours, though at present a number of the ingredients cannot be obtained in Britain. Syrups of every type are discussed.

Americans are experts in salesmanship, and the authors' hints on "wholesaler aids to the retailer" and also on the retailing of ice cream will appeal to manufacturers on this side of the Atlantic. So, too, will the chapters on the management of ice cream plant; the physical and chemical properties of mixes, and the food value of ice cream. The last-mentioned is of particular importance in view of the interest now being shown by British Government Departments in the subject. There can be little doubt but that some of these Departments have their eyes on America's ice cream industry.

BOOKS RECEIVED

Food and Nutrition. By E. W. H. Cruickshank, M.D.(Aberd.), D.Sc.(Lond.), Ph.D.(Cantab.), M.R.C.P.

British Industrial and Engineering Installations. 1946 Edition.

Cold Store Operation. By A. E. Miller, M.Inst.R.

Stainless and Heat-Resisting Steels. By Edwin Gregory, Ph.D.(Lond.), M.Sc., M.I.E.I., F.R.I.C., and Eric N. Simons.

Imperial Institute. Annual Report, 1946.

The New Attack on Bleached Flour

SPECIALLY CONTRIBUTED

Sir Edward Mellanby, F.R.S., Secretary of the Medical Research Council and one of our foremost authorities on nutrition, has recently described important experiments on canine hysteria. He found that dogs given a diet consisting largely of flour which had been treated by the "agene" process invariably developed this distressing complaint. Dogs given flour which had not been agenised, on the other hand, remained in normal health. This remarkable observation has attracted much attention among both veterinarians and human dietitians. There are, however, many gaps in our knowledge which must be filled in before "agenised" flour can seriously be placed on trial as a cause of ill health among human beings.

CANINE hysteria, which is also known as "fright disease" or "running fits," is characterised by an over-excitability of the dog to unexpected sounds or movements, or even to the ordinary events of its daily routine. It is more than the mere expression of fear which would lead, for example, to the animal hiding itself away during a thunderstorm or firework display. At the beginning of an attack the dog seems to become aware of some unseen terror, and in a state of growing excitement starts to emit high-pitched barks or howls. An aimless running round then commences, in light attacks terminating in the animal regaining its senses, or in severe attacks in exhaustion or convulsions. Urination and defaecation are common in the later stages of the attack. Several attacks may occur in a single day, and the animal may be subject to hysteria for weeks on end. The condition, however, is usually curable, and appears to leave no permanent injury. When cured the dog may live for years without suffering from further attacks.

Some Causes of Hysteria

Several causes of hysteria have been suggested, and it seems quite probable that its symptoms are a common end product of many different forms of canine ill-health. It is also to be suspected that the term "hysteria" is not always used to cover precisely the same pathological picture. Thus it has been suggested in the *Veterinary Record* (1947) that hysteria must not be confused with the seizures which occur in teething puppies, or with the effects of the encephalopathy which often follows distemper. Other authorities, however, do not make such fine distinctions, and Grace (1930) considered that "fright disease" was a common complication of distemper.

Hysteria has also been ascribed to intestinal worms, mites in the ear, ticks, intestinal obstruction, or even to a depraved appetite for gravel. In recent years, however, growing importance has been attached to the influence of diet. The injuries that have been mentioned must, indeed, be still regarded as potential causes of hysteria, or of conditions closely resembling it. It has become increasingly clear, however, that hysteria may be produced simply and regularly in experimental dogs by modifying their diet. The most potent factors in causing hysteria of dietary origin appear to be certain wheat products.

The Dietary Factor

The association of hysteria with the use of certain types of dog biscuits and other baked dog foods was noticed many years ago. The experience of veterinarians gradually established that certain batches were much more harmful than others, some biscuits causing hysteria in as little as two to three days. The reason for their injurious action, however, remained vague. Walston (1933) considered that the biscuits both contained a toxic substance, and were deficient in vitamin A. Moulds and the parasite *Tilletia tritici* came under suspicion, while Hancock (1941) attributed the hysteria-producing properties of a particularly bad batch of biscuits to the presence of a pollen or some other seed contaminant of low quality grain.

The first hint that the protein fraction of the yeast might be incriminated came from work in America by Melnick and Cowgill (1937) who observed hysteria among experimental dogs receiving

rations containing gliadin, the alcohol-soluble fraction of wheat gluten. Arnold and Elvehjem (1939) attributed the hysteria-producing properties of baked dog foods to a deficiency of the damaged wheat proteins in the amino acid lysine.

The Toxin Theory

It must be agreed that most of the diets given to dogs in the early stages of research on hysteria were undoubtedly deficient in lysine and other nutrients. The weight of current opinion, however, favours the view that wheat products which produce hysteria do so through the presence of some toxic substance rather than through the absence of an essential nutrient. Thus Wagner and Elvehjem (1944) conclude that hysteria may be developed when wheat gluten is added to a diet which is otherwise adequate. They have, moreover, been unable to prevent the hysteria-producing effect of wheat gluten by adding lysine or protein to the diet.

Wheat has always been regarded as one of the most wholesome and innocuous of our staple foodstuffs, and its ability to cause harm, even in dogs, must come as a shock to many who have trusted in its virtues. It remains to be decided, however, whether the toxic properties are inherent in the natural grain, or are the result of its adulteration or mishandling through human agencies. The existence of natural toxic principles in staple foods, unfortunately, is not without precedent. Maize, in addition to being deficient in nicotinic acid, the vitamin which protects against pellagra, is presumed on the latest evidence to contain toxic factors which predispose the human subject to this disease. Certain species of peas and pulses cause the nervous degeneration known as lathyrism, which is endemic in many tropical countries; while in colder climates poisoning may result from a diet of rye contaminated with ergot. It must also be remembered that crops may sometimes become impregnated with toxic minerals. Thus in certain parts of America the presence of undue amounts of selenium in the soil causes wheat to be highly toxic to cattle and to experimental animals, although Elvehjem and his colleagues have ruled out this possibility in their hysteria experiments. In the light of past experience, therefore, it is quite feasible that even the most trustworthy of natural foodstuffs should under certain circumstances show unsuspected toxic properties.

"Agenised" Flour as a Cause of Hysteria

The recent experiments of Mellanby (1946), however, support the view that the injurious effects of wheat products in dogs are due to adulteration by the miller, and are not inherent in the natural grain. His animals were given a diet of cooked flour supplemented by milk powder, meat, peanut oil, yeast, salt, and vitamins A, D, and C. When the flour was unbleached the animals remained free from hysteria, but frequent attacks were observed in all the dogs which were given agenised flour. Interchanging of "agenised" and "non-agenised" diets between individual dogs was, moreover, accompanied by corresponding changes in the incidence of hysteria.

Mellanby suggests that "improvement" with agene is such a common procedure that all wheat products found by previous workers to cause hysteria may well have been so treated. He assumes that some toxic agent is formed which attacks the central nervous system, although in a few dogs which have djed he has been unable to find any characteristic lesions by ordinary *post-mortem* examination. He points out that the next step must be to compare the hysteria-producing properties of samples of wheat gluten made from agenised and non-agenised flour, and indicates that experiments on this aspect of the problem are already in progress.

The Chemical Effects of Agene

Another important aspect of the problem, on which more adequate information is now urgently required, concerns the extent to which agene, and other bleaching and improving agents, affect the chemical composition of wheat products. Agene, which consists of moist air containing 1 per cent. nitrogen trichloride, presumably has much the same action as chlorine. According to a Departmental Report, quoted by Mellanby, this element can act energetically upon gluten, in a manner which includes the entrance of chlorine into such important parts of the gluten complex as the tyrosine and tryptophane groups. It has also been reported that agene oxidises the sulphur-containing tripeptide glutathione, which activates proteolytic enzymes. Both these changes might be expected to affect the baking qualities of the flour. The bleaching effect of agene is associated with considerable destruction of the yellow pigments of the flour, which are mainly xanthophylls, but it is probable that these are not the only pigments which are destroyed.

It must be emphasised, however, that the amount of chlorine added to the flour is minute in relation to its major chemical components. The ordinary agene process, for example, is insufficient to make any significant alteration in the degree of unsaturation of the fat component. Only those constituents which are most highly vulnerable to chlorine can therefore be attacked. The considerable changes which agene causes in the baking qualities of flour

must therefore be effected through its action on relatively few "key" molecules or through the attack of large protein molecules at isolated points.

Possible Causes of Toxicity

There is as yet no evidence to tell how far the changes giving rise to the hysteria-producing properties of flour are to be identified with those which cause improved baking qualities. Some speculation on the chemical injuries to flour associated with hysteria production may, however, be helpful in showing how much more knowledge is needed before a satisfactory solution of the problem can be reached.

Our first theory may be based on the finding, as quoted by Mellanby, that chlorine enters into the molecule of certain amino acids components of wheat gluten, which must be assumed to be toxic to the nerve cells of the central nervous system. Work to decide whether chlorinated amino acids are actually toxic is obviously desirable. Our second thoughts, however, may incline to the view that hysteria is caused by physical changes affecting the texture of the flour. It is a common human experience that fresh bread, if eaten rapidly in large quantities, may be highly indigestible. Probably this property is associated more with "improved" flours which give a well-risen loaf than with those which make more compact bread. Although Mellanby's dogs were not given their flour in the form of bread, it is conceivable that treatment with agene affected its digestibility in the form in which it was given. The possibility that hysteria may result from gastro-intestinal disturbances cannot entirely be ruled out.

Deficiency of Vitamin B_6

Another interesting possibility has been indicated by several writers (*British Medical Journal*, 1946, Weipers, 1947, Newell, 1947), who have pointed out that there is at least a superficial resemblance between hysteria in dogs and the fits observed by Chick, El Sadr, and Worden (1940) in rats deficient in Vitamin B_6. This factor, which is also known as "adermin" and "pyridoxine," is present in flour, and might well be destroyed by agene. One would have suspected, however, that the yeast component of Mellanby's diet would have ensured that his dogs had enough of this vitamin. The very short time necessary for the development of hysteria when certain dog foods are given, moreover, suggests that some positive toxic factor must be present since most known deficiency diseases develop much more slowly. Finally, Morgan, Groody, and Axelrod (1946) have found little evidence that hysteria is a characteristic feature of experimental vitamin B_6 deficiency in dogs.

General Conclusions

According to the present state of knowledge it is clear, therefore, that hysteria can arise from dietary causes, although it is by no means certain that all cases of hysteria are of dietary origin. Similarly it is clear from Mellanby's work that treatment of flour with agene may under certain circumstances cause it to produce hysteria in dogs, although again it is not certain that all foods which produce hysteria have this action on account of treatment with agene.

The fact that the human population of this country subsists largely on flour so treated as to be an unfit food for dogs cannot fail to give rise to some anxiety, and Dr. Munro Leslie (1947) may not be without sympathisers in his demand for bread which can be guaranteed to have been baked from flour which has not been agenised. The situation seems less disturbing, however, when it is recalled that other animals, including rats, guinea pigs, chicks, and monkeys, have been found to be unaffected by diets capable of causing hysteria in dogs. As Hamilton Kirk (1947) points out, moreover, racing greyhounds throughout the country have, until recently, been fed largely on stale bread, most of which must have been agenised, and have seemed none the worse for this diet.

For the present, therefore, it seems only fair and reasonable that we should keep an open mind about both the scientific and practical aspects of the problem, while realising the importance of the issues which are at stake. Before any extreme view is to be taken against the use of agene, and presumably of other bleaching and improving agents, it will be essential to balance the generally satisfactory record of ordinary bread, as a wholesome article of human food, against the implications of Mellanby's experiments. It will be necessary to find out exactly why agenised flour is toxic to dogs, whether it is generally toxic or is toxic only under certain carefully chosen experimental conditions, and whether it has any unsuspected effects on human beings and other animals. It is vitally important that information on these points should be collected with the least possible delay, but in the meantime there seems no cause for undue panic about the use of moderate amounts of agene in the routine treatment of flour.

REFERENCES

Arnold, A., and Elvehjem, C. A. (1940), *J. Amer. Vet. Med. Ass.*, **96**, 303.
British Medical Journal (1946), **11**, 903.
Chick, H., El Sadr, M. M., and Wilson, A. N. (1940), *Biochem. J.*, **34**, 595.
Grace, W. E. (1930), *Vet. Med.*, **25**, 102.
Hancock, R. C. G. (1941), *Vet. Rec.*, **53**, 549.
Kirk, H. (1947), *Brit. Med J.*, **1**, 200.
Leslie, W. M. (1947), *Brit. Med J.*, **1**, 313.

Mellanby, E. (1946), *Brit. Med. J.*, **11**, 885.
Melnick, D., and Cowgill, G. R. (1937), *J. of Nutrit.*, **14**, 401.
Newell, A. G. (1947), *Brit. Med. J.*, **1**, 314.
Veterinary Record (1947), **59**, 28, 431.
Wagner, J. R., and Elvehjem, C. A. (1944), *J. of Nutrit.*, **28**, 431.
Weipers, W. L. (1947), *Brit. Med. J.*, **1**, 34.

Literary Caviare

THE multiplicity of cookery books published during the past lustrum is a queer phenomenon. Some authors, it is true, have struggled valiantly to present to the reader attractive dishes made exclusively of available foods, but others have blissfully ignored the austerity in which we live.

Some again camouflage Beetonesque recipes by sandwiching them between thick layers of anecdote and reminiscence, getting away with it with varying success. A book* written by a Hungarian will probably appeal to the person who enjoys reading about food that is entirely beyond his reach. With gusto almost amounting to sadism, the author describes dishes of Lucullan elaboration eaten in many parts of the world to the ration-ridden reader.

Mr. Brody first tells about the stuffed cabbage of his native country. It serves a dual purpose—it is eaten with relish, but before this it is used as a hot water bottle. "Toward evening on Saturday it would be cooked to perfection, but it wasn't eaten or even sampled then. Instead, it was put to bed with the lady of the house; the huge iron pot tied with clean dish-rags being placed under a heavy comforter at the foot of the mattress. The next day the dish was served, and the happy participants duly observed that it retained all its flavour and warmth." Let the recipe be hastily reviewed. "Half a pound each of pork tenderloin, beef (round steak), smoked pork tenderloin, and ask the butcher to grind these meats for you." The rest of the recipe may be left to the imagination.

After 1918, Mr. Brody made his way to France and "started to eat his way around." He dined at Foyot's, the Café de Paris, at Prosper Montagné's, and when he was "broke" he ate a *biftek* in a friendly bistro.

The book is divided into sections, starting with hors d'oeuvres, on through soups, fish to coffee, ending with a chapter summing up the art of eating and cooking. The author apostrophises the hors d'oeuvres of the Paris of 1923, but prefers terrine of game, the recipe for which he gives *in extenso*.

In a special chapter on eggs (of course, perfectly useless as a *vade mecum* for the 1947 cook) is related how the author watched the chefs of the *Drei Husaren* make a caviare omelet. (Mr. Brody seems to possess a talent for penetrating into culinary holy of holies.) He divulges the recipe for scrambled eggs "from the archives of one of New York's top supper clubs." Or if you are really interested in poached eggs, you should do them in a pint of Burgundy.

Mr. Brody is fond of the phrase "gastronomical etiquette," which prescribes that hors d'oeuvres must be eaten only at lunch-time, and that the tail of the lobster should be consumed first. "Then comes the coral cord (possessed only by females), a pinkish and exceedingly tasty bite. Next is the tomalley, the liver, which has a different flavour but is not a bit less toothsome than the coral. Now the feet should be torn off, bitten and sucked clean; and finally come the two claws—if the particular fellow you are experimenting on has both of them. Lobsters fight like the devil, and when one of them wants to escape, he'll simply sacrifice a heavy claw."

Mr. Brody waxes lyrical about soups and gives recipes lavishly. He specially mentions one as "a sure-fire remedy for a hangover," and asks canned soup manufacturers to take note. But it is hopeless to quote it here as the ingredients might just as well be in the moon so far as the English cook is concerned. It should be mentioned that the author appears to be writing in America.

Canned, as well as kitchen soups, come in for praise ("everybody eats canned soups not only in America either"), and the author's "best beloved is *purée* of black bean soup."

That Mr. Brody's opinions merit respect is suggested by his election as judge together with Mrs. Wendell Wilkie at a contest at the Ritz-Carlton run by the Girl Scouts of America, held under the auspices of the New York Fishery Council!

In passing (Mr. Brody flits rapidly from recipe to reminiscence, and from reminiscence to pontificality) there is a remarkable apotheosis of the English fish and chips shop. "In old class-conscious England the aristocracy considered it almost vulgar to dine on fish and chips. But lately many a walking stick and arrogant lorgnette have found their way to the fish and chips stores. Perhaps some of the swells recalled that Edward II bought his own fish and vegetables on the shores of the Thames and sometimes prepared them himself."

And so for 192 pages the author rushes on. His *naïveté* is seasoned with an irresistible gusto which takes the reader along with him. He does not worry about vitamins, and very rightly relies on a sound mixed diet, but at times his food chemistry is remarkable. For instance:

* *On the Tip of my Tongue*. By Iles Brody. Pp. 192. London. 8s. 6d. net.

Horseflesh contains slightly more protein than beef, and the sweetish flavour is attributed to nitrogen.

Stories are told of well-known personages, among whom are the Duke of Windsor (who had a *penchant* for caviare omelet), Bernard Shaw, and the beautiful Brazilian singer, Elsie Houston (who carved a turkey expertly), and a host of others.

Were there space, the amazing preparation (from newly hatched egg to the table) of smoked turkey could be described. Instead, the following lyrical praise of the potato may be quoted:

> Oh, how I love that lowly tuber, jovial-figured, democratic, dirty, prolific son of Mother Earth, springing from her womb to the delight of the underdog and the *bon vivant* alike! A few potatoes a day can be heaven. . . .

It is impossible to refrain from making one last quotation. In his chapter on wines (about which, by the way, the author has some original ideas) he tells that

> not long ago the Germans got all the fine French wines. But I'd hate to tell you how the Nazis' wine was diluted in the wine districts of France. I was informed about it by a friend who was present in a populous cellar in the Commune of Margaux just before the barrels of wine were sent to the railroad station to be shipped to Germany. The method was eminently commendable, if Rabelaisian. . . .

And so at the end the book is put aside and one reviewer sups on potato hash made from the second day's remnants of the meat ration.—T. C-W.

German Margarine Industry

SAMPLES of table margarine in German factory production during November, 1945, were removed for examination, and a scrutiny of the figures revealed some values for chemical constants which had not been previously encountered in normal table margarine. (Addendum to B.I.O.S. Final Report, No. 274.) The most outstanding of these peculiarities were the extremely high iodine values, the low saponification values, the high percentages of iso-oleic acid present as indicated by the lead-salt-ether Twitchell method, and the positive hexabromide test indicating the presence of liquid rape oil.

The crystalline form of the ether insolubles under the microscope was "feathery," interspersed with crystals similar to hardened groundnut and soya. Whether this "feathery" crystalline form is peculiar to hardened rape oil can only be conjectured, as no microphotographs are available for this fat.

CORRESPONDENCE

Canine Hysteria

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—I have just read the article on Diet and Canine Hysteria, by Sir Edward Mellanby, from the *British Medical Journal*, December 14, 1946, vol. ii., p. 885, concerning which you had editorial notes in your journal in February and March this year.

The utmost critical examination can make the results nothing but diagrammatic. Dogs fed on agenised wheat flour develop hysteria, hysterical fits, and epileptiform fits. Those fed on non-agenised flour from the same grist do not. Dogs suffering from hysteria can be cured by feeding with non-agenised flour. Presence and absence of vitamin A do not influence the results. Feeding experiments with rats showed no ill-effect with agenised flour.

Sir Edward makes no claim that agenised flour is harmful to man.

Anyone wishing to take sides for or against the use of nitrogen chloride in "improving" flour for human consumption ought to read the article first.

Yours, etc.,

Shaftesbury, Dorset. V. H. MOTTRAM.

Processed Cheese

(*Continued from page* 201)

type of cheese used. The quantity used may vary from 1·5 to 3 per cent. according to *p*H and the desired consistency of the final product. On this latter, too, will mainly depend the amount of water used. It is sometimes desirable to add excess water, to be removed afterwards under vacuum; and in such case the added salt of fusion must be adjusted accordingly so that the more aqueous finished product has the same percentage salt as the less aqueous. The extent and duration of heating must also be carefully controlled in order to avoid, among other things, any risk of saponifying fatty acids in the melt. Maintenance of a temperature of 30° C. to 40° C. for any time increases risk of bacterial infection. Further, the more slowly the melt is cooled so much the firmer is its final consistency.

It is generally thought that there is scope for much wider extension of the processed cheese industry, especially in France. In the U.S.A. it has been estimated that at least 60 per cent. of the total cheese output is processed. In Switzerland, too, the industry is already on a considerable scale, a standard of high quality being maintained.

Acknowledgment.—Photographs by courtesy of Kraft Cheese Company Limited.

Food and an Arctic Adventure

THE recent great freeze-up, with the "killing frost" (to borrow Wolsey's phrase) emphasising our prime necessities of food and warm clothing seemed an appropriate occasion for the long-awaited appearance of an epic tale of Arctic life.* For 274 days Papanin, Shirshov, Fedorov, and Krenkel, four hardy men of the Soviet Union, lived and survived on a large drifting icefloe on which they had landed from choice in 1937. Ivan Papanin, leader of this strange polar expedition and now leader of Soviet activities along her Northern sea route, is an ex-naval rating turned arctic scientist. In previous polar work he had noted a gigantic icefloe drifting with the currents, when suddenly the idea came to him to put "a little house" and an observation post on such a floating island and travel south wherever the currents took him, making magnetic, meteorological, and other observations *en route*. The subsequent tale of Papanin's whim becoming reality, of those nine months' existence of four men and a dog as their icefloe carried them from near the Pole to latitude 70° in the Greenland Sea, is one of extreme interest not merely to the layman, but to the food technologist and those concerned with nutritional science.

Preparations for the Adventure

To spend some nine months on a drifting icefloe would have sounded a hazardous enterprise offering nothing but hardships in past days of polar exploration. Polar blizzards, risks of great fissures and pack ice breaking up the floe, to say nothing of possible encounters with polar bears, were factors to be considered apart from food and fuel supplies. But Papanin and his colleagues had planned everything from the start. They were equipped so completely with radio transmission and reception that reports on their progress, on laws governing drift currents, on the relief contours of the North Arctic ocean bed, and on magnetic and meteorological data were readily sent out in return for a tuning-in to Russian orchestral concerts, news items concerning this troubled world, and other pastimes to fill in leisure moments in their Arctic life. But most absorbing was their provision of food, especially the types and relative proportions of a great variety of canned goods, and the possibility of fresh meat being conserved in that great natural refrigerator (or so they hoped), the icefloe itself.

In contrast to Nansen, who held scurvy to be the greatest danger in polar work, and, since he believed the disease to be due to "poisoning," subjected all his food supplies to careful analysis, the four Papaninites were fully conscious of the necessity for vitamin content to be included in their stores, so much so that even sweets containing vitamin C were included. They took with them 145 metal containers of 43 kgm. each, of which 65 were left in reserve on Rudolf Island. Each container held a wide assortment of commodities from caviare to condensed milk, together with butter, bacon, sugar, cheese, tea, coffee, cocoa, pork sausages, rice, green peas, vermicelli puddings, wheat and potato flour, meat and plain rusks, dried fruit salad, and dried onions. There were also dehydrated products like meat, eggs, milk, and chicken meat combined with chocolate, as well as soups from barley and cabbage, *borshch* (a national Russian soup from beetroot), and such extras as cranberry juice, wild strawberries, and sweets. Packing with waxed paper, Cellophane, and tinfoil was carefully planned, as was the order of packing in the large sealed containers. While near the Pole, Papanin and his companions found concentrates preferable, because of the ease and speed with which a hot meal could be prepared from them. On the icefloe a small silk tent as temporary kitchen gave way to a structure built of ice blocks, primus stoves holding 12 litres of fuel proving good enough for cooking. Cups and mugs, saucepans and frying-pans were all designed to fit into nests to save space.

Cooking Difficulties

Despite all such preparations there were difficulties to be countered. Snow had first to be melted and water brought to the boil on the stoves before the concentrates were used. There was much loading, shifting, and unloading of stores between various points on the floe to be done, due to threat of blizzards and dangers of parts of the floe breaking away; the entire stock had been dispersed to avoid any risk of a large part breaking completely away and parting the men from one main food dump. There was also the failure of Nature's own refrigerator, holes cut in the ice, which did not preserve the rump steak and pork chops; "electrical refrigerators seem to be necessary even in the Arctic," as Papanin put it. A frozen pig, a calf, and a salted nelma or Siberian salmon were packed in the ice with the hope of keeping fresh food available for some time. But much of the meat was attractive only to the dog Merry, who, despite good meals, developed such an appetite that its digging-up activities had to be severely dealt with.

* *Life on an Icefloe*. By I. Papanin. London. Pp. 240. 18s. net.

Yet in face of everything, the four men were well nourished, thanks to Appert, the father of canning, and his "sealing the seasons." At times reserves of food and fuel had to be kept in mobile units on sledges when ice jamming threatened sections of the floe. At times, too, the men would rely on snacks, hot tea, and sausages to keep up body and spirit. At other times sausages would become suspect, as did some rissoles from the "high" fresh meat which were disguised with onion and garlic. Occasionally signs of Arctic living creatures appeared, but no fresh meat or fowl was forthcoming as gull and fulmar were shot at but missed, and a bear and two cubs kept out of range of the four suspicious-looking creatures.

On February 19, 1938, the four men were taken off by two icebreakers sent by the Soviet Government. Since during their entire sojourn on the ice they had made full use of scientific instruments, Papanin's expedition provided a number of interesting data, such as the fact that the weather is much calmer in the "cold ice cap" region than on the outskirts of the Arctic Ocean. But now the full account is published there are not only such details for geography, meteorology, and other pure sciences, but an underlying story of how four men were sustained for nine months' exposure when provided with every foodstuff that modern processing and packing could devise.—M. S.

New Type Canadian Wheat

THE best type of wheat yet bred for growing in Northern Alberta, where the land is good but the growing season relatively short, has been created through the efforts of scientists at the Dominion Department of Agriculture's Central Experimental Farm at Ottawa.

It is "Saunders" wheat, an early type that has been under study and development for nine years and has been declared highly successful.

The department's experimental plots have yielded 200 bushels of seed which will be sown this spring at the Dominion's experimental stations at Lacombe and Beaverlodge in Alberta. From there they will be increased for wider distribution to wheat growers of the north-west.

Saunders wheat originated from Thatcher, an earlier disease-resistant type, and a species known experimentally as C26-44.7. For five years the best seed of this cross was tested for early ripening qualities in the Peace River area of Northern Alberta, while experiments were carried on for four years in Dominion Experimental Farm laboratories and testing stations in the Canadian West.

Over the final four-year test, the new Saunders variety averaged in Alberta a yield equal to that of Thatcher and slightly better than Marquis, the chief parent of all types developed in recent years.

It matured three days earlier than Thatcher and five and one-half days earlier than Marquis—important conditions in a country where frost lingers late in spring and sets in early—in late summer or the early autumn.

The Cereals Division bred into the new species resistance to stem rust and loose smut, diseases that formerly caused heavy loss when wheat was grown in the north-west. There was relatively high resistance to bunt, leaf-rust, and root-rot. The Saunders kernel has the good colour of Marquis and is better than that of Thatcher.

It was named Saunders in recognition of the contributions to wheat-growing of Dr. William Saunders, first director of the Experimental Farms Service, and his son, Sir Charles Saunders, first Dominion cerealist, who developed Marquis, the first "early wheat."

In carrying on grain research, experimental farm specialists in Ottawa have developed in recent months a new variety of oats, resistant to stem and crown rust. The new type is of great importance to farmers in Eastern Ontario and Quebec, where the oat crops are important and where heavy damage from rust has been suffered in recent seasons.

Work on the new species of oats began in 1932 and it was evolved from Victoria, a South American variety, and Vanguard, a type widely grown in Canada but subject to crown rust. The experiments were carried on in the Dominion Rust Research Laboratory at Winnipeg, Manitoba.

Sugar from Cellulose

ACCORDING to Donald P. Hopkins, B.Sc., F.R.I.C., writing in *Modern Knowledge*, "if by some chemical trickery the enormous chain of cellulose units could be broken down into single units and water forced into combination with those units, indigestible cellulose could be converted into sugar."

Referring to the enormous quantities of wood required for the supply of cellulose, Mr. Hopkins states that whatever happens in the next few years, the future demands for cellulose would be almost certain to force the world to look towards "soft" plants as well as wood.

New kinds of cellulose transformations could be expected, not only in the reshaping of cellulose, but also in its conversion into more valuable substances. Mr. Hopkins visualised the time when such plants as artichokes, with their thick stems of cellular plant material, could be grown on a large scale solely for their potential raw cellulose.

A Medium for Pectin Investigation

DURING the course of an investigation on the bacteria associated with the rotting of potatoes in storage, carried out on behalf of the Agricultural Research Council, a large number of isolates was tested for ability to break down pectin.

Previous investigators have used one of the following methods in the examination of the breakdown of pectin: (1) observation of the growth of an organism in a medium with pectin as the sole source of carbon; (2) testing of enzyme preparations of cultures for ability to cause loss of coherence in strips of plant tissue, or changes in viscosity of a pectin solution; (3) measurement of the rate of utilisation of a particular pectic substrate by progressive chemical analysis. While the above methods would be satisfactory, it seemed that a more suitable method, for a rapid qualitative test, would be to grow the organisms on a pectin gel. Organisms which were able to break down pectin would cause liquefaction of the medium. In the past, it has only been possible to prepare pectin gels with high sugar concentrations, and under acid or alkaline conditions[1] which would not support the growth of bacteria. Low methoxylated pectin gels[2, 3] can now be prepared with a low sugar content and with an increased range of *p*H, and it is possible that they might be used in the present investigation, but they have not been available to me.

Through the courtesy of the A.S.P. Chemical Co., Ltd., of Gerrards Cross, a sodium pectate powder was obtained which would form a gel at a neutral *p*H and in the absence of sugar. The medium is prepared as follows: a basal solution is made up containing $NH_4H_2PO_4$ 1 g., KCl 0·2 g., and $MgSO_4$ 0·2 g. per litre of distilled water. To this solution is added 50 ml. per litre of buffer solution (McIlvaine's phosphate-citrate buffer, 0·2*M* NaH_2PO_4, 0·1*M* citric acid). The mixture is heated to 70° C. and sufficient of the powder added to give a 1 per cent. concentration. The mixture is further heated almost to boiling and held at this temperature for about five minutes. From the time of the addition of the pectate powder, the mixture must be thoroughly stirred. It has been found helpful to add bromo thymol-blue to the medium as an indicator. The medium is tubed and sterilised by bringing momentarily to 120° C. in an autoclave, turning off the gas and allowing to cool. This method of sterilisation[4] reduces breakdown of the pectate.

The setting of the medium is brought about by a certain concentration of calcium ions (approximately 3·2 per cent. of the powder), which convert some of the sodium pectate to calcium pectate on cooling. The addition of a small proportion of a 10 per cent. solution of calcium chloride increases the structural viscosity of the gel.

Tubes, inoculated by needle stabs from broth cultures, of *Bact. phytophthorum*, *B. carotovorum*, *B. aroideae*, and *Bacillus polymyxa* showed slight liquefaction after two days at 25° C., and the liquefaction was almost complete after a week. *Bs. subt lis* produced a slight liquefaction after four days. *Bact. aerogenes*, *Bs. mesentericus*, and *Pseudomonas fluorescens* did not liquefy the medium after twenty days. No extensive examination of cultures of fungi has been undertaken; but *Botrytis cinerea* and *Sclerotinia minor* produce a liquefaction of the medium.

Liquefaction of this medium indicates the splitting of the pectate unit and is not necessarily the same as loss of coherence in plant tissues. Comparative tests, however, have shown that liquefaction of a pectate gel and loss of coherence of plant tissue appear to be correlated.

I am much indebted to Dr. W. J. Dowson and Dr. N. A. Burges for their advice in this work. This brief account is published as it is considered that the medium may have applications in other directions.

D. RUDD JONES.

Botany School,
Cambridge.

REFERENCES

1 Spencer, G., *J. Phys. Chem.*, **33**, 1987 (1929).
2 Baker, G. L., and Goodwin, M. W., *Del. Agric. Exp. Sta. Bull.*, No. 234 (1941).
3 Baker, G. L., and Goodwin, M. W., *Del. Agric. Exp. Sta. Bull.*, No. 246 (1944).
4 Davis J. G., and Rogers, H. J., *Abs. Proc. Soc. Agric. Bacteriol.*, 41 (1938).

The foregoing was published in *Nature*, vol. 158, page 625, Nov. 2, 1946.

Rose-hip Butter

THE manufacture of rose-hip butter in Germany during the war is described in J.I.O.A. Final Report, No. 51. The berries were crushed and the meat separated from the seeds. Then the seedless meat was ground in machines resembling a colloid mill operating with a wide opening, using carborundum discs. This operation was often performed in an atmosphere of carbon dioxide or nitrogen. Thereupon about 25 per cent. sugar was added and the product sterilised by heating to 85° C. The ascorbic acid content immediately after manufacture is said to have been about 220 mg. per cent. without the use of inert gases during grinding and about 350 mg. per cent. when these gases were used.

British Industries Fair

TO ASSIST EXPORT TRADE

More than 3,000 exhibitors, representing approximately 80 United Kingdom trades, are showing at this year's British Industries Fair, held in London (Olympia and Earls Court) and Birmingham (Castle Bromwich) simultaneously from May 5 to 16.

The primary object of the Fair is to assist the export trade of the country, but it also offers an excellent opportunity for home buyers to increase their knowledge of British goods and to note the industrial progress which has been made since the last Fair was held, eight years ago.

BIRMINGHAM SECTION

The Birmingham section (Castle Bromwich) includes a large number of items of plant and equipment of interest to the food manufacturer. W. P. Butterfield, Ltd., are showing a stainless steel jacketed boiling pan and galvanised tanks. Another exhibit of considerable interest is a galvanising bath complete with furnace brickwork, which is sectioned to show gas burners and controls, by Thompson Brothers (Bilston), Ltd. This firm also shows a circular stainless steel tank suitable for bulk storage or rail transport of liquids, the interior surfaces including welded seams having a polished finish suitable for the reception of milk.

Industrial Lighting

The British Thomson-Houston Co., Ltd., Research Laboratories, during the eight years that have elapsed since the last B.I.F., have been constantly developing new methods of lighting to meet the demands of industry. The result of this is shown in the lighting equipment on the BTH stand. Among these are Mazda fluorescent lamps, industrial and commercial fittings, and an internally silvered infra-red lamp by the use of which fuel and other economies in drying and baking can be effected. This lamp, which will shortly be in production in this country, is being shown for the first time, and is claimed to be more efficient than the older types.

Mechanical Handling

Equipment for the mechanical handling of food in the factory and the maintenance of plant and machinery is well represented in Birmingham. Stackers, trucks, conveyors, both of the motor and gravity roller type, are shown by J. Collis and Sons, Ltd., while Electro-Hydraulics, Ltd., show conveyancer fork-lifting trucks with their various attachments which enables them to undertake work of special natures. Another fork-lift truck is the "Stacatruc," manufactured for I.T.D., Ltd., by Clifford Aero and Auto, Ltd., a subsidiary of Clifford Motor Components, Ltd. This carries loads of 2 tons, lifts and stacks to a height of 9 ft., hauls two 2-ton trailers with ease, and manoeuvres in very small gangways.

Leather Beltings and Belt Treatment

A complete range of pitchline V-belts, V-belt pulleys, and also mechanical rubber products and dressed woven rubber beltings, leather beltings, mechanical leathers, and industrial tapes and webbings are being shown by J. H. Fenner and Co., Ltd.

Products for belt treatment, furnace cement, jointing material and paste, etc., are among the engineering specialities offered by Thomas and Bishop, Ltd.

Flame Spraying Unit

The exhibit of Schori Metallising Process, Ltd., shows a complete flame spraying unit in operation, applying coatings of metals and plastics, the former by direct sintering, and the latter by actual fusion. Perhaps the most important of these materials from the point of view of food manufacture is polythene.

Stainless Steel Pumps

Of interest to food factory engineers will be the stainless steel pumps of Mono Pumps, Ltd., with which are used a non-contaminating rubber stator for food and beverages. Also a brine pump specially developed for brine injection for curing bacon and ham.

Lubricating Systems

A very large range of lubricating systems for many types of equipment is the contribution of Tecalemit, Ltd. Heat transmission plant, including air heating equipment for air conditioning plant, air coolers, Diesel engine coolers, oil coolers, and a number of other important items are shown by the Spiral Tube and Components Co. Ltd.

*p*H Meters

While most of the instruments are being shown in Olympia, Marconi Instruments, Ltd., are showing theirs in Birmingham. Among them are the *p*H recorder, which is available in the ranges of *p*H 1-6, 6-11, 7-12, and 1-11. The moisture recorder for grain operates by radio frequency, relating moisture content with dielectric properties, the measuring apparatus comprising a self-balancing capacitance bridge and writing recorder. Other instruments are *p*H meters and moisture-in-grain meters of different types.

Vacuum Cleaners and Mixers

Heavy plant for dust removal, pneumatic conveying, industrial portable vacuum cleaners, and sack cleaning plant are to be found at the stand of British Vacuum Cleaner and Engineering Co., Ltd.

Under joint arrangements with the Gloucester Development Committee, Wm. Gardner and Sons (Gloucester), Ltd., are exhibiting on the Gloucester Area Stand their latest design streamlined machines and also a small laboratory scale mixer with in-built

motor which has special features in regard to cleaning, etc.

Can Lacquers

Super zinnatine and sulfatine for fruit and vegetable cans, varnishes and coating lacquers for the tinprinting trades, together with enamels and paints, are among the exhibits by Arthur Holden and Sons, Ltd.

Barrier Cream

Protection against occupational dermatitis is an important one, and a great measure of safety is provided if, where practicable, the skin is coated with a film of ointment before handling materials and dirt. Rozalex, Ltd., manufacture several types of ointments and also a dispenser designed for issuing the preparations to users in factories and workshops, which can be seen in Birmingham.

EARL'S COURT

Essences

Essences for the food industry figure at both the Earl's Court and Olympia sections. W. J. Bush and Co., Ltd., are exhibiting in both places. At Earl's Court, they are specialising on their products for the food and beverage industries, while at Olympia the main feature is fine chemicals.

Cumming Parsons, Ltd., are showing their butter flavour-aroma "Twinlink" and soluble essence limes for beverages.

Stevenson and Howell, Ltd., are showing their "Red Ball" brand essences and colours for the confectionery and food manufacturing trades, and for the soft drinks industry. A. Boake, Roberts and Co., Ltd., also show a range of essences, flavours, food colours, preservatives, and emulsifying agents.

Displays of cake and pudding mixtures, custard powder, and table jelly crystals, etc., are shown at the stand of Sunmill Food Products, Ltd.

A description of the development of a new company for pilchard canning in Mevagissey, Cornwall, is made by Newball and Mason, Ltd., suppliers of culinary essences and herbs.

Sausage and other Machines

Potato peeling, meat slicing, mincing, and sausage making machines are some of the items of equipment shown by Selyac Distributors, Ltd., and the Peerless Electrical Manufacturing Co., Ltd., show the same class of equipment.

Food Products

Among the manufacturers of food products, such as jam, marmalade, canned fruits, and vegetables, etc., are Chivers and Sons, Ltd., Citrus Products Co., Ltd., and Crosse and Blackwell, Ltd.

Packaging

Among the suppliers of packaging materials are the Thompson and Norris Manufacturing Co., Ltd., who display their corrugated fibreboard boxes and containers. They are distributing a useful illustrated brochure entitled *Modern Packaging*.

At the stand of Adhesive Tapes, Ltd., is a demonstration of the use of Sellotape for sealing packeted foodstuffs, and the way in which adhesive tape may be used in publicising sales messages.

OLYMPIA

Scientific Instruments

Instrument firms are well represented at Olympia. Baldwin Instrument Co., Ltd., are showing a selection from their range of scientific instruments, which include the "N.P.L." moisture meter for seeds, grain, and hygroscopic materials, moving coil indicating meters and galvanometers, and laboratory-type electrometers. At the Negretti and Zambra, Ltd., stand a large selection of temperature controllers, pyrometers, and thermometers are seen. Short and Mason, Ltd., are showing pneumatic and electro-pneumatically operated instruments suitable for all industrial applications, comprising fulscopes, time schedule controllers, process timers, safety thermal limit recorders, and flow diversion valve. This latter has been exclusively designed for the dairy industry, and its function is to prevent milk that has been treated being passed as safe until a definite temperature has been reached.

A high sensitivity recorder which can be used in conjunction either with a resistance thermometer or a thermocouple, and which has application wherever accurate and high-speed recording is required, is among the equipment shown by Sunvic Controls, Ltd. Another interesting item is an electronic proportioning controller, developed for applications in which a resistance thermometer cannot be employed. It will give control proportional to the deviation from the desired temperature of loads up to 3 kw. at 230 volts.

Gums and Spices

Stafford Allen and Sons, Ltd., are showing, among other things, powdered gums and spices, essential oils and flavouring essences.

Adhesives

Gummed strip sealing tape, plain and printed, sealing machines for parcels, bales, and containers, and a range of adhesives, gummed seals, etc., are shown by Samuel Jones and Co., Ltd.

Insecticides

Insecticides are represented by Imperial Chemical Industries, Ltd., Hygienic Chemical Co., and Ashe Laboratories, Ltd. At these stands, information on the remarkable advances in insecticides, weed-killers, and the like are to be gained.

Office Equipment—Banking

Office equipment is represented by The Shannon, Ltd., who have some interesting improvements in filing technique to demonstrate.

The Midland Bank, Ltd., have stands at Earl's Court and Olympia, and deal with encashments and issue of letters of credit, travellers' cheques, drafts, and foreign bank notes. Advice is also available on exchange control regulations, conditions, and prospects of trade with foreign countries, and names of British firms and organisations interested in particular lines of business.

Britain's Best

ENGINEERING AND METALCRAFT

Bookings of stands at the Engineering and Metalcraft Exhibition to be held at the Horticultural Hall, Westminster, from May 12 to 23, show that firms in the industries concerned are planning confidently for the future, undeterred by present material and labour shortages.

The Exhibition is being extensively publicised both in the U.K. and abroad. Invitations are being sent to many thousands of home and overseas buyers; acceptances already received indicate a big attendance. The demand for British products abroad is again demonstrated by the requests received from overseas firms for copies of the Exhibition catalogue.

The first of a series to be held in London during 1947 and 1948 under the title "Britain's Best," the purpose is to focus attention on the quality of British goods for both home and export trade. For this reason the exhibitions will be selective rather than inclusive. They are primarily designed for trade visitors, but the public will also be admitted during certain hours.

Applications for tickets should be sent to the sponsors, the British Bulletin of Commerce (Exhibition Department), 17-18 Henrietta Street, Strand, London, W.C.2.

Society of Public Analysts

The Annual General Meeting of the Society of Public Analysts was held at the Royal Society on March 7, Dr. G. W. Monier-Williams, O.B.E., M.C., M.A., F.R.I.C., the President of the Society, being in the chair. The Financial Statement and the Report of the Council for the past year were submitted and approved.

The following Officers and Members of Council were elected for the forthcoming year:

President: Lewis Eynon, B.Sc., F.R.I.C.

Past-Presidents serving on the Council: F. W. F. Arnaud, Bernard Dyer, E. B. Hughes, G. Roche Lynch, S. Ernest Melling, and G. W. Monier-Williams.

Vice-Presidents: R. C. Chirnside, D. W. Kent-Jones, (Mrs.) D. W. Matthews, and, *ex officio*, C. H. Manley (chairman, North of England Section), and H. Dryerre (chairman, Scottish Section).

Hon. Treasurer: George Taylor.

Hon. Secretary: K. A. Williams.

Other Members of Council: C. A. Adams, R. Belcher, H. E. Cox, (Miss) I. H. Hadfield, J. H. Hamence, J. Haslem, A. D. Mitchell, J. R. Nicholls, Norman Strafford, R. W. Sutton, H. N. Wilson, E. C. Wood, and *ex officio*, Arnold Lees (Hon. Secretary, North of England Section), and R. S. Watson (Hon. Secretary, Scottish Section).

Appointment

Mr. T. H. Summerson, chairman of Thomas Summerson and Sons, Ltd., of Darlington, has been elected to the Grand Council of the Federation of British Industries for 1947-1950 as a representative of Panel 4.

*

Dr. J. N. B. Coppock, of Newark, Nottingham, has been appointed director of research for the British Baking Industries' Research Association, which will make a scientific investigation of nutritional problems.

New Branch Formed

The British Aluminium Co., Ltd., and Alexander Brown and Co., have announced that by mutual agreement the Scottish business of the British Aluminium Co. will be transacted through their own Scottish Branch Office to be opened in Glasgow as from July 1 next.

Alexander Brown and Co. who have acted as the selling agents of the British Aluminium Co. in Scotland for over fifty years, will be relinquishing the agency, but will continue to act as principal stockists in Scotland for the products which they have been handling in the past.

Visit to America

Mr. Charles R. Davis, sales manager of the Uni-Gun Lubricating Equipment, Ltd., has left by air on a visit to their American associates, Bowser International, Ltd., to study the latest developments in garage equipment.

Overseas Appointment

N. V. Polak and Schwarz announce that Mr. J. Ph. C. Wessing has been appointed Overseas Sales Manager, and his address will be c/o Dah Lee Co., 274, Chung Cheng Road, Eastern, Room 21, Shanghai, China.

Nobel Peace Prize Nomination

Sir John Boyd Orr, Director-General of the Food and Agriculture Organisation, has been nominated for the Nobel Peace Prize in 1947 by the British National Peace Council. The nomination declared that Sir John "has done more to obtain recognition of the vital relationship between welfare and peace than any other person."

New Household Frigidaire

At the recent Ideal Home Exhibition, visitors were able to view the new Frigidaire household refrigerator. The model combines in one cabinet fast freezing, frozen storage, extra-cold storage, moist and normal storage.

Surplus War Equipment

George Cohen, Sons and Co., Ltd., have just signed a contract with the Ministry of Supply for the acquisition of the whole of the plant and equipment accumulated at the Main Collection Depot for War Surplus at Avant-Port, Brussels.

The purchase includes unused engineering equipment and stores, notably electric generating sets, transformers, pumping equipment, petrol-driven charging sets, etc. The plant will be available for export from Belgium. Items can be imported into Great Britain providing an import licence is obtained. Such licences will also be necessary in respect of domestic transactions in Belgium.

Election of Committee of B.D.M.A.

The following Officers and Executive Committee will serve the British Disinfectant Manufacturers' Association for the year 1947:

Chairman: Mr. T. C. Betteridge (Cooper, McDougall and Robertson, Ltd.).
Vice-Chairman: Mr. A. J. Black (Lehn and Fink Products, Ltd.).
Hon. Treasurer: Mr. Victor G. Gibbs (William Pearson, Ltd.).
Hon. Auditors: Mr. F. C. Seager (William Pearson, Ltd.), and Mr. A. Gale (Milton Antiseptic, Ltd.).
Executive Committee:
Mr. R. G. Berchem (Jeyes Sanitary Compounds Co., Ltd.).
Mr. A. E. Berry (Milton Antiseptic, Ltd.).
Mr. Knowles Edge (William Edge and Sons, Ltd.).
Mr. W. Elliott (Killgerm Co., Ltd.).
Mr. V. G. Gibbs (William Pearson, Ltd.).
Mr. W. Mitchell (Hull Chemical Works, Ltd.).
Mr. W. Morgan-Thompson (Monsanto Chemicals, Ltd.).
Mr. J. E. Wells (Sanitas Co., Ltd.).

Potato Breeder Dies

The death has occurred of Mr. Donald Mackelvie, who was the most outstanding breeder of new varieties of potatoes in the British Empire for the past forty years. He was awarded the Lord Derby Medal eight times for his new varieties of potatoes. Trained in Edinburgh as a chartered accountant in his youth, he became interested in potato culture about forty years ago and carried out his experiments on a series of plots on a croft at Lamlash, Arran.

"Arran Chief" was his first real success, and was used very extensively throughout the country during the first world war. His first award was in 1919 for "Arran Comrade," and his last was in 1945 with his "Arran Viking."

Two of his other varieties were "Arran Banner" and "Arran Pilot." Another one, "Arran Ally," was awarded the Lord Derby Medal not for Mr. Mackelvie but for the purchaser who bought all his stocks.

Exclusion of "C" Licensees from Transport Bill

STATEMENT BY LORD SANDHURST

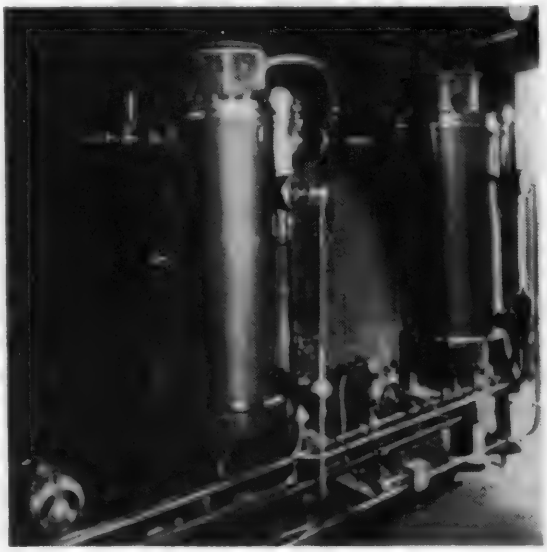
The following statement by the Lord Sandhurst has been issued by the British Road Federation:

"On behalf of the 110 National Trade Associations constituting the membership of the Federation and representing more than 250,000 traders, I welcome the decision of the Minister of Transport to exclude the 'C' licensee from the provisions of the Bill.

"Mr. Barnes is to be congratulated upon having adopted a statesman-like attitude upon a difficult and thorny question. The British Road Federation has been a leading protagonist in the fight to maintain the unfettered liberty of the 'C' licensee. We have no intention of relaxing our vigilance, and believe that every effort must be maintained to safeguard the flexibility of the nation's supply services.

"The Minister will receive the thanks of the entire trading community for his decision, and we would urge him to give further consideration to the advisability of postponing the passage and operation of the rest of the Bill. To do so would not be interpreted as a sign of weakness, but only as an earnest of the Government's intention not to conduct what must, at best, be a dangerous experiment with a vital national service at a time of unparalleled crisis."

Electrode Boiler



Food factories, restaurants, hotels, and other large establishments wishing to reduce gaseous or solid fuel consumption, will be interested in the electrode boiler manufactured by Bastian and Allen, Ltd.

Apart from its low running cost, a great advantage of this boiler is that it can take all the night shift load without attendance, and can be started up from cold in a few minutes. No attention is required, due to the automatic operation. The boiler can provide steam for all kitchen appliances from cold in about eight minutes, whereas gas boilers take about forty-five minutes and coal boilers about two hours.

Other advantages are continuous operation at 97 per cent. to 98 per cent. thermal efficiency, small size and weight, easy automatic control, and absolute cleanliness.

Change of Name

Technical Products, Ltd., have announced that, as from March 11, the name of the Company will be changed to Shell Chemicals, Ltd.

Tractor automatically coupled to a special van-body trailer with movable partitions, and roller shutters at side and rear.

Delivery of Mixed Goods

A new system of outer-zone food distribution is being operated by means of the Karrier "Bantam" tractor and special van-body trailer, as illustrated. The owners of the van are multiple grocers and one of their most urgent problems was how to simplify the delivery of mixed consignments of goods to their various branches.

This problem was solved by using the "Bantam" tractor, coupled to a roomy van trailer which is equipped with movable partitions, with roller shutters at the side and rear. The van measures internally 18 ft. long by 7 ft. wide and 5 ft. 9 in. high, and the six hinged partitions can be spaced as required, to separate various loads. The goods are partitioned off by the despatch department so that the driver, on arrival at a particular branch, has only to handle one compact load.

India: A.B.C.M. Branch Office

The Association of British Chemical Manufacturers has secured accommodation for its branch office in India, the address being Janmabhoomi Chambers, Fort Street, Ballard Estate, Bombay, 1.

Change of Name

Mars Confections, Ltd., have recently changed their title to Mars, Ltd., and will be using this name in all future communications.

Gelatine Order

After consideration at the last Council meeting, the Ice Cream Alliance has decided that they should not raise objection to the recent Control of Gelatine Order, which forbids the use of gelatine in the making of ice cream. It is understood that the product is in very short supply and present quantities are fully required for other purposes.

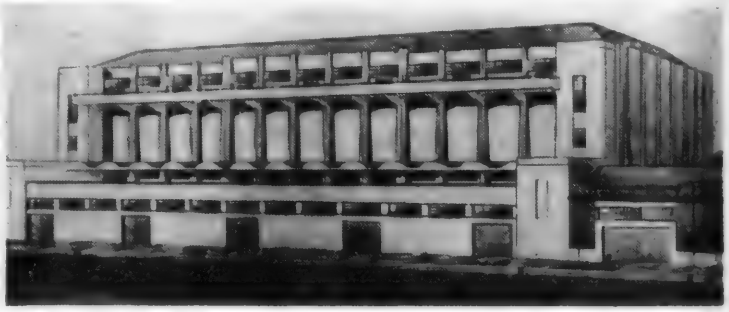
Food Agreement with Denmark

An agreement has been reached between the Danish and United Kingdom Governments supplementary to the agreement of July, 1946, on the supply of butter, bacon, and eggs by Denmark to the United Kingdom.

The Danish Government wish to achieve a target figure of 75,000 tons of bacon to be exported to the United Kingdom during the production year 1947-1948, though it is realised on both sides that this is largely dependent upon Denmark's obtaining considerable quantities of imported grain.

In addition, Denmark undertakes to sell 30,000 tons of meat either in the form of cattle or frozen meat during 1947, of which between 5,000 and 6,000 tons is in respect of a carry-over of the 1946 contract.

On the British side an undertaking has been given that purchases within Danish 1947 allocation of Argentine oilcakes to be used during the current harvest year shall be brought within the terms of the agreement of last July.



New Cold Store at Southampton

The Southern Railway have now completed plans for a new and improved cold store at Southampton Docks, and preliminary work on the site has already started.

The original cold store was almost entirely destroyed by enemy action in 1940. The new one will be erected at the western end of Berth 108 in the new docks, a site which offers better road, rail, and sea facilities than the old one, enabling much speedier movement of cargo in and out of the store. Constructed in reinforced concrete with five stories giving space for 6,000 tons of meat, fruit, and dairy produce imported from Australia, New Zealand, South Africa, etc., the store will be equipped with the most up-to-date refrigerating plant. The total cost is estimated at £250,000.

The building will be leased by the Southern Railway to the International Cold Storage and Ice Company, the Lessees of the old store.

New Research Association

The British Food Manufacturing Industries Research Association was formed on January 1 last by the amalgamation of the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery, and Jam Trades (formed in 1920), and the British Food Manufacturers' Research Association.

Dr. L. E. Campbell, formerly Director of Research to both Associations, has been appointed Director of Research to the new Association.

The laboratories are situated at present at Holloway, London, N.7, until such time as new buildings to be erected at Leatherhead are available.

Society of Chemical Industry

The Committee, exercising the powers vested in it according to the rules, has appointed the officers of the Food Group for the session 1947-1948, to take effect after the Annual General Meeting of the Society.

Chairman: Mr. T. Rendle (1946-47); Dr. E. B. Hughes (1947-48).
Vice-Chairman: Dr. H. E. Cox (1946-47); Mr. T. Rendle (1947-48).
Hon. Treasurer: Dr. J. R. Nicholls (1946-47); Dr. J. R. Nicholls (1947-48).
Hon. Editor of Food Group Proceedings: Mr. T. Rendle (1946-47); Mr. T. Rendle (1947-48).
Hon. Secretary: Dr. J. H. Bushill (1946-47); Mr. L. H. G. Barton (1947-48).

The present Committee consists of the following:

A. J. Amos.	T. Moran.
A. Anderson.	R. H. Morgan.
B. M. Brown.	H. Nicol.
L. E. Campbell.	S. J. Rowland.
J. G. Davis.	R. G. Tomkins.
S. H. Edgar.	S. M. Tritton.

Of these, Messrs. B. M. Brown, H. Nicol, S. J. Rowland, and R. G. Tomkins retire and are not eligible for re-election for one year (Rule 7).

The retiring Committee will make two appointments (Rule 5) to the new Committee, leaving two vacancies to be filled by election by the members.

Obituary

It is with regret that we record the death, on March 21, of Sir Joseph Barcroft, F.R.S., the distinguished physiologist.

Born on July 26, 1872, Joseph Barcroft was educated at York and Cambridge before entering King's College, Cambridge, where he took a first in both parts of the Natural Science Tripos and graduated in 1896. After his election to a fellowship in 1900 he was awarded the Gedge prize, and soon became known as a lecturer and research worker, lecturing before many learned societies both in this country and in the United States. During his tenure of the chair of physiology at Cambridge from 1925 to 1937, research students came from all parts of the world to work under him.

Knighted in 1935, Sir Joseph Barcroft was appointed director of a team under the Agricultural Research Council in 1942, when he developed an important school of research into the physiology of farm animals. In 1943 he received the Copley Medal, the highest award of the Royal Society.

A man of great personal charm, both as a lecturer and a writer, he leaves behind him a record of distinguished service.

He was elected a Fellow of the Royal Society in 1910, President of the physiological section of the British Association in 1920, and Fullerian Professor of Physiology at the Royal Institution from 1923 to 1926. He was editor of the sixth edition of *Huxley's Physiology*, joint editor of the *Cambridge Comparative Physiology*, and departmental (physiology) editor of the fourteenth edition of the *Encyclopaedia Britannica*.

In particular, the generous and unselfish work he did on behalf of the Nutrition Society will also not be forgotten. He had been active in the Society's interests ever since its foundation in 1941, and had been its chairman since 1945. No effort was too much for him in furthering its welfare, and the success of the Society has been the measure of his unstinted and unfailing devotion.

Scottish Seaweed Industry

Plans are going ahead for the development of a seaweed industry on North Uist. Mr. William MacKenzie, a member of the engineering staff of the Scottish Seaweed Research Association, is at present on the island, undertaking practical engineering work on the collection, baling, drying, and shipment of seaweed from the island and to determine whether or not this area is suitable for a permanent factory.

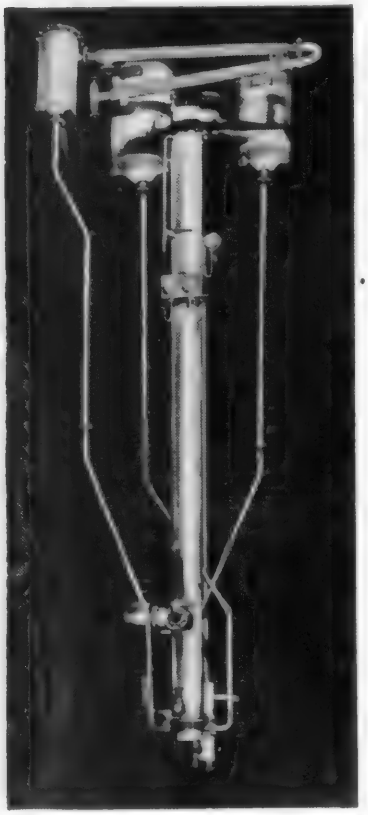
The work will continue for six months and on its success depends the decision to establish a new factory in North Uist to extract from seaweed the raw materials for a variety of industries. The success of the experiment will depend largely on the degree to which the collection of weed can be mechanised, the amount of co-operation shown by the islanders, and the readiness of the various industries involved to use the products derived from the weed.

House Review

Crossley Bros., Ltd., have resumed publication of *Crossley Chronicles*. They state that owing to the paper shortage, publication will for the time being only be spasmodic. The present issue, dated January, prints an interesting illustrated article on the "Flexibility in Power and Heating with Oil Engines," together with a diagramatic general arrangement plan of engines, generators, and accessories.

Spray Drying

An interesting exhibit at the Royal Dublin Spring Show will be the Kestner Spray Drying Equipment.



The standard plants, consisting of an atomiser, a drying chamber, dust separator, and dust collecting system, are in use for the manufacture of many widely different products. There are, however, some complex materials which present difficulties in drying by these plants, and experimental work has produced modified spray driers capable of producing high grade powder where no satisfactory method of producing the material in powder form was previously known.

The illustration shows a triple circular evaporator with an ester recovery system used particularly for fruit juice, coffee concentration, etc.

Closure Manufacturers' Association

MR. JOHN RYAN REVIEWS RAW MATERIAL SITUATION

In a speech made by Mr. John Ryan at the Annual General Meeting of the Closure Manufacturers' Association, he gave a short survey of the work achieved during the past year, and sketched broadly some of the directions in which the country's economic difficulties might be expected to affect the closure trade.

Dealing with raw materials, he said that the production of tinplate and blackplate during the past year had shown a slight upward trend, mill production having reached a peak of some 300,000 basis boxes per week in December, 1946, but had now receded to a level of 250,000 basis boxes.

Mr. Ryan pointed out that this country is called upon to supply some of the Empire countries with tinplate to the extent that products for which it is used come back to this country for its vital supplies, and the balance between home and export will always be a question which will have to be faced from time to time, in the light of the circumstances prevailing. He felt that the present stringency of tinplate in the United States might not continue, and that in America there might be a surplus for export to lighten the load on this country.

While stocks of tin were at a lower level and production in Malaya and elsewhere continues disappointing, Mr. Ryan was of the opinion that availability of tin should be sufficient for their purposes during the coming year.

The Association is represented on the Tin Consultative Committee, and has been very active both in drawing the attention of the Ministry to their interests in the subject, and in studying the problem so far as it affects their interests.

Among the other matters mentioned by Mr. Ryan were packaging restrictions and census of production, and he pointed out that the latter would be an annual matter from now onwards. Cork, paper, and board supplies have become increasingly critical.

Finally, Mr. Ryan made reference to the effects of the shortages of coal on the future of the industry. He did not think that the fuel crisis would do more than postpone the improvements to which they had looked forward for so long.

Canned Pilchards

Canned American pilchards now being imported into this country are sometimes labelled "Sardines" in accordance with the domestic practice in America. As many as possible of these tins are being reserved for other than civilian requirements, but it is probable that a small proportion will be found from time to time among those issued for distribution under points rationing.

The sale of these goods under the original labels is not an offence under the Merchandise Marks Act, but they must be sold at the prices and points values prescribed for pilchards.

Pilchards are always packed in oval or round (flat or tall) tins, whereas all genuine "Sardines" are packed in the familiar oblong sardine tins and there should therefore be no confusion.

Fish Filleting Machine

A filleting machine from America of revolutionary design and performance is now being installed at Hull (Yorks).

It is claimed that the machine fillets fish at the rate of forty-five fish per minute, and gives 18 per cent. more flesh per fillet than hand cutting.

Refrigerating Compressors

The sixth number in their series of Technical Bulletins, which deals with refrigerating compressors, has been issued by the U.D. Engineering Co., Ltd.

The bulletin, well produced and illustrated, includes examples of some recent installations of very considerable size and unique application. Copies may be obtained from the company.

Fuel Cut Economies

The problem of coal shortage at the Chelmsford works of Crompton Parkinson, Ltd., was solved by the use of waste oil-treated coke breeze. Enquiries revealed that adequate supplies were available at the various gas works throughout the country, and after experiments, it was found that satisfactory combustion could be obtained by developing a special technique of boiler operation. Although obviously not as efficient as coal, breeze was actually used as boiler fuel at Chelmsford for three months.

*

At the works of The Poppe Rubber and Tyre Co., Ltd., Diesel type engines were installed in 1938 for generating their own power. During the recent "switch-off" periods, they were one of the few firms throughout the country able to report "production as usual."

*

A steam advisory service has been set up jointly by Spirax Manufacturing Co., Ltd., and Sarco Thermostats, Ltd., to enable industrial steam users to obtain the latest advice on methods and techniques of improved steam utilisation. The service covers every aspect of steam control and usage for process and heating, including thermostatic temperature control, steam trapping installations, air venting installations, and so on.

Area services have been set up at all key points of industry, in charge of regional engineers who are fully competent to survey a steam system or individual plant and to put forward recommendations likely to result in a more efficient use of steam and an improved output economy.

Obituary

We regret to announce the death, on March 7, of Mr. F. Poppe, the chairman of The Poppe Rubber and Tyre Co., Ltd.

His whole life and energies were devoted to his work, and his passing will be a great and irreplaceable loss to the rubber industry in general.

OBITER DICTA

- A fresh salmon producer is a man who produces fresh salmon. *The Minister of Food.*
- It is perfectly obvious that it is impossible to get a substantial meal nowadays.—*Captain Marsden, M.P.*
- Mrs. Wightwick was ill with blood pressure and made a *bona fide* mistake in charging for the fish.—*Defending Counsel at Gravesend Magistrates' Court.*
- For the past seven years we have been a buffer between the Ministry of Food and the consumer. — *President of Lancashire Council of Meat Traders.*
- If we could eliminate preventable diseases among animals we could double the world's supply of food.—*Dr. Petrus du Toit, South Africa's Director of Veterinary Services.*
- Britain is being fed in a huge soup kitchen maintained by public charity—the loans and money gifts from the Dominions.—*Lady Glen-Coats, member of the non-political Scottish Convention.*
- The Government have gambled on food supplies just as Mr. Shinwell gambled—and lost—on coal supplies.—*Mr. R. S. Hudson, former Minister of Agriculture.*
- We have four or five major Bills going through Parliament, none of which contributes one egg, one lump of coal, one house, one shirt, or indeed anything but an increased Civil Service and more form-filling and disturbance. — *Sir Ian Fraser, M.P.*
- It would seem that there are people who do not like bully beef. Why, it is hard to understand. It is both a satisfying bulk food and a delicacy more subtle than the caviare which is now on sale in London at 10 guineas a pound.—"*Glasgow Herald.*"
- Hundreds and thousands of people who could never have succeeded in business are engaged to hinder, misdirect, command and countermand, threaten and bully in the most fantastic and Gilbertian manner the people who built up, with all its faults, the industrial system which has been the envy of the world.—*Alfred Edwards, M.P.*

Mr. Malcolm Dunbar Retires

After forty years with L. Oertling, Ltd., including twenty-eight years as Managing Director, Mr. Malcolm Dunbar retired on April 6.

Mr. Dunbar is a member of the Royal Institution and of the Society of Chemical Industry. He has long been a prominent member of the Rotary Club of London, of which he is an ex-President. His very many friends, both in scientific and social circles, will wish him all happiness in his retirement from the firm and success in the other business interests with which he will continue to be associated.

Chemicals from Petroleum

As a result of many years of research work, the Shell Petroleum Company has recently announced a scheme for the production of chemicals from petroleum.

It introduces a new industry into the country, as a result of which it is estimated that chemical imports from America will be reduced by about £800,000 a year.

Their widespread application includes agriculture, plastics, horticulture, and food, and it is expected that the products will greatly assist food production by aiding pest control. It is claimed that cost of application will be reduced and efficiency of control increased by the new methods.

Use of Adhesives

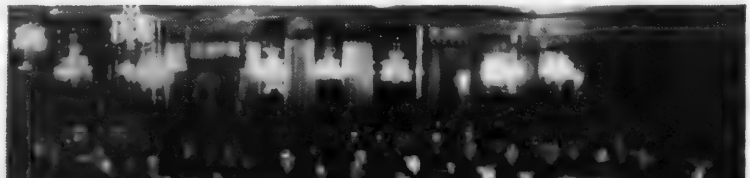
Among the adhesives manufactured by Duché and Knight, Ltd., under the trade mark "Keystone," is an improvement on the normal kind, used for labelling bottles and jars by automatic machine. Another gum is prepared for hand labelling.

For sealing small skillets by hand or machine where an overlap paste is needed, is a gum which is used in conjunction with other gums as pick-ups for hot or cold tins.

Among other varieties is a gum for sealing outer cartons and one for fixing panel labels to tins, which is suitable for lacquered or decorated tins.

The Chemical Society

ANNIVERSARY LUNCHEON



More State assistance for the development of pure and applied chemistry was urged by Viscount Bennett, former Prime Minister of Canada, speaking as the chief guest of the Chemical Society at the anniversary luncheon held in London on March 20. "Only in this way," said Lord Bennett, "could we attempt to repay part of the debt mankind owed to chemistry for the spectacular achievements of the past 100 years." These achievements had been admirably described by Sir Harold Hartley in his lecture "A Century of Chemistry" recently delivered before the Royal Society of Arts, and they were a token of what chemistry was likely to accomplish during the next 100 years.

Responding to Lord Bennett's toast to the Society, Professor C. N. Hinshelwood, the President, said that membership was continually increasing and now numbered nearly 7,000. It was essential that the present cramped headquarters should be extended, but at present, although the Government was sympathetic, new accommodation was difficult to find. Financially the Society was very sound, and he was pleased to announce that the fund for bringing foreign scientists to this country now amounted to more than £18,000.

The luncheon was only one of a number of preliminaries to the Centenary celebrations in July. He paid tribute to the enormous amount of work in connexion with these celebrations which was being done by the staff, and he was particularly gratified that it had been possible for the retiring secretary, Dr. D. C. Martin, to take time from his new post of assistant secretary of the Royal Society to assist the new secretary, Mr. L. R. Batten, in his task.

Nearly 150 members and their guests attended the luncheon. Apart from Lord Bennett, the principal guests were Dr. G. Roche Lynch, President of the Royal Institute of Chemistry; Dr. L. H. Lampitt, President of the Society of Chemical Industry; Professor E. K. Rideal, chairman of the Chemical Council; and Sir Edward Salisbury, Director of the Royal Botanic Gardens, Kew, and a secretary of the Royal Society.

Before the luncheon, the annual meeting of the Society was held in the morning at Burlington House during which it was mentioned that the annual cost of producing the Society's publications now exceeds £12,000. The library had continued to expand, and the number of books borrowed had reached a record high level during the past year.

Following the luncheon, Professor Hinshelwood delivered the Presidential Address at 3 p.m. at Burlington House. He took as his subject chemical kinetics. In the evening the members visited the New Theatre to see Ben Jonson's "The Alchemist."

Empire Scientific Conference

The Preliminary Report of The Royal Society Empire Scientific Conference, June-July, 1946, has now been published.

The Report, which has been printed in book form, numbers nearly seventy pages and covers every phase of the Conference. Excellent *résumés* are given of every one of the discussions, together with the recommendations made. An index shows the list of papers prepared for the Conference, the names of the delegates attending, and the constitution of the Steering Committee for the Conference.

British Buy Frozen Foods

First deliveries of frozen food have now appeared in British shops and have been given a very satisfactory welcome by the consuming public. So far, deliveries are severely limited and are confined mainly to Bird's Eye packs, Dutch packs, and English Smedley packs. The range includes French beans, mixed vegetables, sliced carrots, cauliflower heads, and whole tomatoes, as well as a fairly large range of fruits, including sliced plums, sliced peaches, pulped plums, and pulped peaches in sugar syrup.

A number of large stores have organised special displays to market the frozen food—some of which is coming from Holland by air—and are training assistants in the technique of frozen food selling. A major problem is the shortage of frozen food conservator cabinets, and until these are mass produced in reasonable volume, it is very doubtful whether the industry in Britain can make any real progress. To date, only those organisations able to find equipment for merchandising have been able to undertake the marketing of frozen food, while there is also the undoubted fact that food supplies are still so acutely scarce as to make this type of food in short supply.

There can be no doubt, however, that Britain is due for a major expansion of the frozen food industry, immediately both the necessary food and equipment are available.

Food Manufacture

Automatic Hose Nozzle

The Resley hose nozzle is being produced for the first time since 1939. It fits the hand, and a slight pressure on the lever handle regulates the flow of water from a steady stream to a fine spray as desired. By releasing the pressure, the flow of water is automatically and immediately shut off. A knurled nut regulates an adjustable jet, and the nozzle can also be used as a stationary sprinkler.

Its many uses include gardens and lawns, car washing, shop front hosing, etc.

Dairy Students' Lunch

Following the conclusion of the course of lectures on ice cream organised by the Smithfield College of Food Technology with the co-operation of Mr. Peter K. MacKenzie, the Director of Education for the London and Home Counties Division of the Ice Cream Alliance, a luncheon was held at the Connaught Rooms on March 24 attended by the lecturers and students.

Expressing the hope that further lectures on various aspects of the ice cream industry would be held in the near future, Dr. Evans, Principal of the Smithfield College of Food Technology, said that it was possible that better accommodation for the College would be found. In this respect, it was up to all members of the trade to approach their L.C.C. members and press for such accommodation to be made available.

Dr. Cruikshank, speaking on behalf of the lecturers, said he was keen to see education carried on in a co-operative spirit, *i.e.* the health authority working in close co-operation with the ice cream manufacturer. He suggested that reports on ice cream made to the Local Authority should also be sent to the ice cream manufacturer, and said that if ice cream were graded into several different grades, manufacturers would be encouraged to produce a better article.

Following the luncheon, a combined Brains Trust and Quiz was held covering the work done during the lecture course.

Britain's Floating Exhibition

WIDE VARIETY OF PRODUCTS EXHIBITED

The first post-war "Floating Exhibition" was scheduled to sail for South American ports at the end of April. This Exhibition has been organised by Mr. R. M. S. Morrison, Latin-American Trade Adviser to a large number of British Industrial concerns, in conjunction with the South American Saint Line, Ltd., and is being mounted in one of the holds of the Saint Line's 9,500 ton modern cargo liner, the M.V. *St. Merriel*. It comprises over fifty exhibits, ranging from bakery machinery to a 16 h.p. model of a well-known British make of car and from plastic mouldings to small diesel engines.

Representing a fair cross-section of British industrial achievement, an important feature of all the products shown is that they are available for immediate delivery or delivery within six months of receipt of the order.

Arrangements have been made to give working demonstrations of much of the machinery included in the exhibition, and it is proposed to use the bakery mixing machinery to prepare the mixes for the making of the ship's bread and cakes while in port.

B.E.A. Council Luncheon

An interesting address on the work and aims of Trade Unionism was given by Mr. G. W. Thomson, President of the Trades Union Congress, to the Council of the British Engineers' Association, at a luncheon in London on March 18.

Mr. Thomson said that he believed that the people of the country should understand how greatly engineering contributed to their welfare, security, and comfort. The key position it held in the social structure made it necessary that it should develop a real social conscience to which individual interests would take a second place. The Trade Unions were a factor in maintaining peace in industry.

Dealing with the great interest taken by the T.U.C. in fostering education and research among its members, he mentioned the scheme in operation with the London School of Economics and Ruskin College which, with the start of its own College, would lead eventually to the technical training of Trade Union officials.

In conclusion, he affirmed his belief that the country was now moving into an era of controlled and co-ordinated economy, in which each industry was a unit. Whatever lay ahead, they could collectively be of the highest service to the country which we all loved so well.

Mechanical Handling

There are still many problems to be solved for efficiently mixing, blending, sifting, crushing, pulverising, compacting, and feeding materials, and these problems have been given serious thought by the Blending Machine Co. who are closely associated with Electromagnets, Ltd.

The result is the development of new and improved machinery, including a high-frequency sifter and separator, a continuous blending machine for use where mixing and blending is desired, a tea-cutting machine, and a machine for treating floor sweepings.

They enable guarantees to be given for single and combined processes without dividing responsibility.

Lipton Debenture Conversion

Redemption of the existing 4 per cent. and 4½ per cent. Debenture Stocks and the issue of a new 3 per cent. Debenture Stock into which holders may convert is announced by Lipton, a subsidiary of Home and Colonial Stores.

Home and Colonial Stores and associated interests have indicated that they will convert holdings of existing stocks representing the balance of £200,000 nominal of 3 per cent. stock.

Treasury consent has been obtained.

OVERSEAS

Meat Packing Plant in Kiev

Construction of a big meat-packing plant, which is to turn out annually several thousands of tons of meat products, has been commenced in Kiev. Production processes will be fully mechanised.

The sausage, meat, and fat departments have already started production in temporary establishments.—*Reuter.*

Sugar Prospects

World sugar production for the 1946-1947 season is estimated at 12 per cent. above last year's output. The Cuban crop for 1947 is expected to reach 5,500,000 tons, a near record. Production there during 1946 is estimated at 3,257,000 tons.

Australian Fruit Crop

Before the war Australia shipped from four million to six million bushels of apples and about one million cases of pears a year to this country. Last year's shipments—the first since 1940—totalled about 900,000 cases of apples.

More would have been sent if transport had been available. Refrigerated shipping has been extremely short due to submarine losses, and British refrigerated ships must be used primarily for meat, dairy products, and eggs. Only a small amount of space, therefore, can be reserved for unrationed foods such as apples.

Production of apples in Australia varies between 10,000,000 and 14,000,000 bushels a year, and pears between 2,000,000 and 3,000,000 bushels. One of the most popular varieties of apple is the Granny Smith. Apart from its delicious flavour, this apple has a natural grease in its skin which enables it to be kept in cases or on straw-covered floors for months without deterioration. Australians are so confident that this brand will gain favour in this country, that many orchardists replanting their properties are concentrating largely on Granny Smith.

Germans Run Own Food Production

The administration of food and agriculture has now been transferred to German hands, and the State Governments will in future be responsible for the execution of directives of the bi-zonal administration on food and agriculture.

The Control Commission will henceforth issue no directives to German farmers or German agricultural organisations.—*Reuter.*

Goat Meat for Britain

The Manager of the Meat Producers Board, speaking in Auckland, New Zealand, has referred to complaints by British housewives that New Zealand goat and other poor quality meats were being used for rations.

He said that Britain had asked for all possible meats and these qualities were included for manufacturing purposes. The Board were disturbed at the thought of these being used as fresh rations in view of the repercussions on the Dominions meat industry.—*Reuter.*

Sugar in Germany

According to the Control Commission for Germany little more than half the foodstuffs required to maintain the basic ration of 1,550 Calories for the normal consumer can be produced in the British Zone, which is impoverished by lack of fertilisers and intensive cultivation during the war years. The remainder, including 165,000 tons of grain per month, must be imported.

In 1946, enough sugar beet was grown to make the Zone independent of sugar imports. Approximately 300,000 tons of sugar have been produced, and the monthly consumption is about 23,000 tons.

Yeast factories rely on the molasses, a by-product of sugar refining from the sugar beet processing factories. Sugar and syrup from the refineries is also supplied to biscuit factories. Enough seed has been produced to sow 120,000 hectares of sugar beet in 1947.

Dried Beans for Britain

The Washington Agricultural Department have announced an additional allocation of 55,000 bags of dried beans of 100 lb. each to Britain for the six months ending June 30, 1947.

Apple Butter

Apple butter, while it has never had much popularity in Canada, is made in considerable quantities in the United States, says E. P. Grant, Horticultural Division, Dominion Experimental Farms Service. It is made of apples, boiled apple juice, sugar, and spice, which are cooked, pulped, and sieved. The finished product is of a butter consistency and has a tart, spicy, apple flavour.

Soviet Vitamin D Factory

In Biskupice near Zabrze (Hindenburg) in Lower Silesia, the first factory of vitaminised foods has been opened. The owners, two engineers, have taken out a patent for their method of production for the vitaminisation of flakes, babyfood, and barley. For the time being the factory is using only barley as raw material, but shortly it is to start processing and vitaminising soya and its products. The Polish Ministry of Food has given the factory its official support, and similar factories are to be opened at Gliwice, Czestochowa, Tarnow, and Radom.

Soviet Antarctic Whaling

The first Soviet whaling flotilla to operate in the Antarctic has harpooned 256 whales and obtained more than 3,000 tons of blubber, according to the *Soviet Monitor.*

The expedition, under Captain Voronin, is now at the 70th Parallel of the Southern Hemisphere. A tanker from Odessa is taking fuel, food supplies, and whaling equipment to the flotilla. It will cover some 9,000 miles to reach the expedition. Returning, it will bring the first blubber to be secured by Soviet whalers in the Antarctic.

Tunisian Olive Oil

PROSPECTS FOR 1947 HARVEST

In spite of all the difficulties brought about by the war, the occupation and military operations, the olive oil industry continues to prosper. France is still suffering from a shortage of oil, but this is due to various causes such as lack of shipping, shortage of bottles, and also the fairly large oil ration in the South which replaces butter. Nor must one overlook the black market. This is very large both in Tunis (where the open market is actually short) and in France itself. Production, on the other hand, is satisfactory and it is one of the post-war mysteries how, in spite of growing production, there should still be shortages. Perhaps the answer is speculation and finance.

However, in the field of oil production the position is not unsatisfactory. Recently the Tunis government published a report on the economic situation. Production, which was 65 million kilos in 1939-1940, fell sharply the next year to 17 millions, recovered to 23 millions in 1941-1942, and in the following two years was 50 million kilos each year. Stocks enabled 30 million kilos to be sent to France following the liberation, and although the 1944-1945 and 1945-1946 harvests were poor owing to the exceptional drought, it is hoped that the 1946-1947 harvests will be more abundant.

In order to safeguard the reputation of the olive oil, as well as to satisfy the taste of consumers, strict surveillance is exercised over the qualities for export, which are carefully graded. The varieties cultivated are fairly numerous, but the most popular for oil production are grown in Chetoui in the North, Shemlali in the Sahel, and Sfax in the South. Grafting is widely used for spreading the culture, and the trees, which grow to between 10 and 12 metres in the North and between 20 and 24 in the South, are carefully regulated in growth to give them a regular form. Output varies according to the region. In the North a tree may give from 8 to 18 litres of olives, while in Sfax it is from 40 to 160 litres. In a normal year 100 litres of olives give between 16 and 25 litres of oil.

Most of the Tunisian refineries are worked by animal traction, but in addition to about 1,000 of these there are almost 500 using mechanical traction, and among the latter several have very modern machinery.

Extraction of the oil is made in three operations: crushing the olives, pressing the paste, and separating the oil from the margarine. The crushing is usually done by a mill which works the olives for thirty to thirty-five minutes. The paste is then divided into receptacles and undergoes two successive presses by hydraulic machines which expel from the mass a mixture of oil or margarine, and crushed pulp. To separate the oil from the margarine the tendency is to replace natural decantation into communicating receptacles by centrifugation by means of a turbine constructed on the same principle as a skimmer. The remains of the olives, after the extraction of the oil, are treated in draining factories with carbonic sulphur or ethylene trichloride. The annual production of oil from the residue amounts to about one-tenth of the Tunisian olive oil production.

Dublin Jam Manufacturers

The 55th Annual General Meeting of Williams and Woods, jam and confectionery manufacturers, was held in Dublin recently.

Mr. Robert Thompson, chairman and managing director, in the course of his address, stated that the Company's sales showed an increase over the previous year and that the stock position was better than it had been twelve months ago.

Plant had been maintained in first-class condition, and plans to install some new machinery and to improve and extend the Company's premises, which would result in improved storage accommodation, were proceeding satisfactorily.

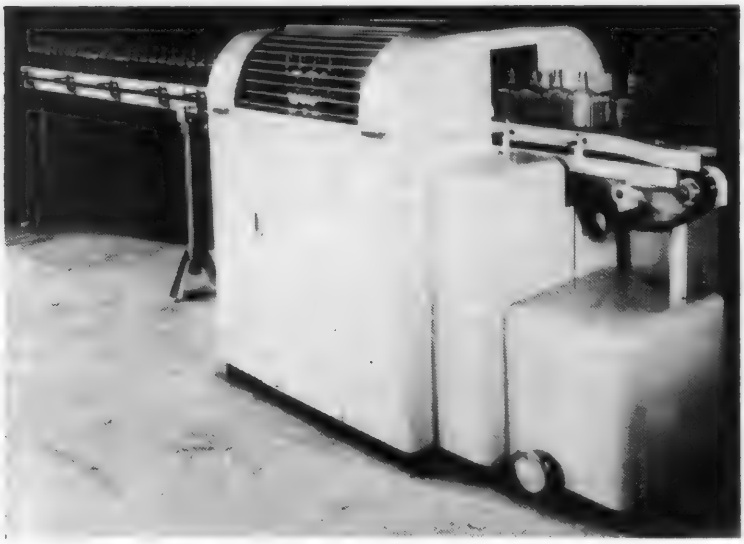
The year 1946 proved a difficult one, but all employees were kept in full employment.

The chairman also stated that the Board recommended that a dividend of 7½ per cent., less tax, be paid on the Company's ordinary shares. This was an increase of 1½ per cent. on the maximum amount allowed during the emergency in Eire. Also recommended was the payment of a special bonus of 2½ per cent., less tax, on the ordinary shares.

Indian Castor Oil Exports

India has lifted the control on exports of castor oil.—*Reuter.*

New hygienic aluminium sardine tins—a product of Norway.



Automatic inverted air cleaner for handling bottles, jugs, and jars in various sizes recently produced in America.

Sugar Control Extension

President Truman has appealed to a conference of congressional leaders for an extension of war powers to control sugar, rice, and other "strategic" materials.

Mr. Truman emphasised the need for control over materials such as tin, antimony, sugar, rice, hemp fibres, and certain medicines including the new drug streptomycin.—*Reuter's Trade Service.*

Irish Margarine

Considerable anxiety is felt throughout Eire at recent comments by the *Journal of the Medical Association of Ireland* regarding the quality of the margarine now on sale in Irish shops. The margarine contains no vitamin A, although it does contain vitamin D.

Irish margarine manufacturers state that every effort has been made to procure supplies of vitamin A for incorporation in the margarine, but supplies of the vitamin available are unstable, necessitating the addition of a preservative, which is not permissible under Eire's Food and Drugs Act.

The price of margarine in Eire is 1s. 6d. per lb., as compared with 6d. per lb. in pre-war days.

South Africa Ends Rationing

Mr. Jan H. Hofmeyr, Union Minister of Finance, announced recently that South Africa's food position had improved sufficiently to make consumer rationing unnecessary. The Government has decided, therefore, to abandon coupon and card rationing schemes for foodstuffs and the registration of consumers.

Flour Confectionery Products

Eire manufacturers who hold permits to purchase sugar for the manufacture of flour confectionery, and who have had a rather lean time since the introduction on January 18 of bread and flour rationing to Eire, benefit by a recent Order of the Irish Minister for Industry and Commerce. They may obtain authority to purchase an extra specified quantity of flour.

The order stated that the extra confectionery which it would now be possible to manufacture should be distributed equitably on the basis of previous trade among the manufacturers' regular trade customers, but that in no circumstance should supplies be withheld from present registered consumers.

Peeling Potatoes without Waste

The flame peeling of potatoes has been developed during the last few years, mainly in the U.S.A. The Russian version, known as the "Flame Peeler," is to be produced on a large scale in the Russian Zone of Germany. This claims to be capable of peeling potatoes without waste, the method being to heat the potato for a short period at a high temperature and then cool it suddenly. The peel then cracks and falls off.

About thirty of these peelers were in operation in Germany before the end of the war, and it is hoped that by increased use of the peeler several thousand tons of potatoes will be saved.

Eire's Canned Meat Exports

"In the season 1945 to 1946 approximately 30 million one-pound cans of meat were exported to Britain, representing an intake from farmers of 81,000 cattle for which they were paid almost £1,000,000, practically twice what they would have obtained had the cattle been exported alive, by reason of the low price offered by the British Ministry of Food."

This statement was made by Mr. P. Kavanagh, chairman of the Dublin Export Canners' Association, at the lunch of the Publicity Club of Ireland in Dublin.

An important aspect, Mr. Kavanagh said, was the fact that 81,000 hides were retained for Irish tanneries.

Before the war there was one cannery in Ireland packing beef for export, but eighteen months from September, 1939, there were ten. Government inspectors were installed in the abattoirs and canneries, and in a short time Irish canned beef attained such a reputation in Britain that housewives using their small allowances of points on canned meat insisted on Irish brands.

Mr. Kavanagh added that the cost of labour directly employed on killing, boning, and canning of meat amounted to £2 2s. 9d. per head per beast, against a labour cost of 1s. 6d. per head for walking them up a ship's gangway.

MINISTRY NEWS

Bakery Production Officer

By arrangement with the Research Association of British Flour Millers, Mr. W. E. Spencer, of the Cereals Research Station at St. Albans, has accepted a temporary appointment as Chief Bakery Production Officer (part-time) in the Ministry of Food. Mr. Spencer, who is well known in the bakery trade as a lecturer and demonstrator, gave valuable help in connexion with the National Bread Survey which took place during the war. In his new appointment he will be chiefly concerned with the present Survey, and will be available to give practical help and advice to traders who are having special difficulties with the quality of their bread.

Amendment of Sugar

The Minister of Food has made an Order amending the Sugar (Control and Maximum Prices) Order, 1943. The effect of the new Order is as follows:

(*a*) The maximum wholesale price of manufacturing sugar is increased by 1d. per lb.;

(*b*) the maximum retail price of manufacturing sugar is increased by 1½d. per lb.;

(*c*) the maximum wholesale price of all sugar packed in 1 cwt. bags is increased by 1½d. per cwt.;

(*d*) certain sugar sold for ships' stores is exempted from the maximum price provisions.

The alterations were effective as from March 16.

The Flour Order, 1947

A new Order which revokes the Flour Order, 1945, together with the subsequent amending Orders, has been issued by the Minister of Food. It makes certain new provisions and consolidates others. The Order came into force on March 30, 1947, and henceforth all prior Orders and amendments thereto are revoked in so far as they refer to wheaten flour and wheat by-products.

In the definition of a Sale by Retail (page 4 of the Order) an amendment has been made which places an institution in the same position as a catering establishment.

Article 10, which relates to sales of flour for export, has been altered. Henceforward a miller or importer must charge the price prescribed in Item 10 of Table II in Part I of the First Schedule when selling flour to an exporter for export.

Several alterations have been made in the Schedules. In the First Schedule the price of semolina sold in bulk has been increased from 70s. to 85s. per 280 lb. The price of flour for export has been altered and there is now one price for all types of flour exported by millers and exporters of 85s. per 280 lb., with the usual margin of 9d. per 280 lb. on a sale to an exporter in the case of flour other than semolina. The price of wheat germ is raised from £20 to £23 per ton. In Part II of the First Schedule the scale of deposit charges for returnable containers has been amended. Carriage provisions have been altered so as to apply also to flour sold for export. In Part II of the Second Schedule provision is made for an increase in the maximum retail price of semolina.

German Patent Position

With reference to the publication by the British Intelligence Objectives Sub-Committee of Reports on German industry, and in connexion with the Exhibition on this subject which is now touring certain Regional centres, the Board of Trade wish to point out that, although no invention made in Germany during the period between September 3, 1938, and December 31, 1945, can become the subject of a valid British patent, nevertheless, some of the information gathered in Germany may be covered by valid patents or patent applications in the United Kingdom.

In order to avoid infringing patent rights, therefore, firms interested in exploiting any particular item are advised to investigate the patents position in the United Kingdom before going into production.

Similar investigations are also desirable before exports are made to any particular country abroad.

Crown and Mudgeon Fat Disposal

As from March 1, crown and mudgeon fat from sheep and lambs (mutton mates or reddings) was made available from slaughterhouses to meat manufacturers, retail butchers or Retail Buying Committees all the year round. Hitherto this class of fat has been available to such purchasers during the summer months of the year only.

The prices of the above materials were increased from April 12, until further notice, as follows:

(*a*) Crown and mudgeon fat from sheep and lambs (mutton mates or reddings) sold to authorised collectors for edible purposes, from 6d. per lb. to 8d. per lb. delivered.

(*b*) Sales of pig mates (crown fat) to R.B.C.s or retail butchers, etc., from 6d. per lb. to 8d. per lb. delivered.

Whey-fed Pigs

Where arrangements cannot be made during the cheese-making season for drying or condensing whey, the liquid whey will be available for feeding to pigs. Such supplies should in the national interest be used by pig feeders as a supplement to their ordinary rations, but if, in particular localities, the supply of whey cannot be consumed except by feeding additional meal, County Agricultural Executive Committees are being authorised to allow any pig keeper, as an alternative to his present rations for his pigs, cereal feeding-stuffs at the rate of 1 lb. for each 8 gal. of whey consumed up to the end of June, 1 lb. for each 2½ gal. consumed in July and August, and 1 lb. for each 2 gal. consumed in September and October. In Scotland, application for the alternative ration should be made by pig keepers to their Agricultural Executive Committee. Farm cheese-makers and cheese factories applying for rations on the alternative basis will be required to state also the numbers and class of pigs being fed on whey.

No supplementary meal allowance can be granted when whey ceases to be available. Pig feeders should, therefore, in their own interests adjust their operations before cheese-making ceases.

Ministry's Survey

FOOD SITUATION DURING 1946

A survey of the food situation in 1946 has recently been published by the Ministry of Food, a short abstract of which is given below.

The Ministry's handling of the food situation during 1946 must be set against a background of world food shortage, transport and labour difficulties.

Measures were taken in the United Kingdom to limit consumption of cereals, which culminated in bread rationing for the first time in British history. A National Bread Survey was conducted in August into the quality of 90 per cent. extraction bread. This showed that baking standards, while satisfactory, were distinctly lower in the South of England than in the North. During the summer acetic acid was released to bakers to check rope in bread, and from August the calcium carbonate content of national bread was doubled.

The oils and fats supply position was affected by the ban on the export of ground nuts from India, and by the poor 1945-1946 whaling season, which necessitated cuts in the rations of cooking fat and soap.

Fish supplies showed almost a 100 per cent. increase over those for 1945. The Ministry stimulated the herring industry by subsidising processing plants, encouraging installation of quick freezing plants at ports, and providing supplies of refrigerants in railway wagons. Limited quantities of surplus herrings were converted into oil and meal.

Fruit and vegetables were also more plentiful than in the previous year, the home potato crop serving the whole market owing to the ban on Channel Islands exports due to the danger of Colorado beetle. The major part of the home crop of soft fruit was again allocated to jam manufacturers. Quantities of the rarer fruits were imported later in the year by private traders and sold at uncontrolled prices.

Increased supplies of sugar enabled additional allocations to be made for jam and sweet manufacturers, as well as for the ice cream and soft drinks industries. Trade was re-opened in a number of miscellaneous items such as *glacé* cherries, olives in brine, preserved ginger, spices, and peels.

Subsidies, limiting retail food index to 122 per cent. of pre-war average, cost about £370 millions during the year.

Calorie intake in the United Kingdom rose from 2,890 per head per day in 1945 to more than 2,900 in 1946, this figure being only 3 to 4 per cent. below the pre-war average. Infant and maternal mortality rates reached new low levels during the year.

Trade with Japan

The appointment has been announced of Mr. James H. Ewing as head of an official Mission in Tokyo to be in charge of sales to, and purchases from, Japan made on Government account on behalf of the United Kingdom, the Colonies, and certain other areas.

For the present all Japanese foreign trade is on a Government to Government basis, and transactional correspondence with private firms in other countries is not permitted by the occupying authorities. Enquiries related to the proposed supply or purchase of specific commodities should not be addressed to the new Mission direct, but to the Board of Trade (Sundry Materials Branch), 10, Old Jewry, London, E.C.2. (Clerkenwell 7871.)

Import of Citric Acid

Small quantities of imported citric acid are now being distributed. It is proposed to allocate supplies direct to such importers as can establish their claim to having engaged in this trade in the years immediately preceding the war.

Importers who wish to participate in the scheme should apply for full details to the Ministry of Food, Miscellaneous Food Products Division, 39, Portman Square, London, W.1.

Arctic Research

The Ministry of Agriculture and Fisheries have placed an order for a 600 ton ship intended entirely for research work in Arctic waters. Costing more than £100,000 and modelled on approved Arctic trawler lines, the ship, to be named the *Ernest Holt*, will be ready for service in 1948.

Apart from her research equipment, the *Ernest Holt* will be fitted to carry out experiments in fish storage and preservation.

Token Imports

Arrangements have now been made, at the request of the U.S. Government, for the addition of further items to the Consolidated List of goods to which the Token Import arrangements apply. The following goods may now be imported in token quantities from all the countries participating in the scheme, *e.g.* Canada, U.S.A., Belgium, Switzerland, France, Denmark, Sweden, Holland, Luxemburg, Finland, Italy, and Norway.

Among the additions to the Consolidated List of Token Import Commodities are quick frozen fruits, onion and garlic salt, and adhesive labels.

Importers of foods are reminded that they should ensure that the labels of food packed in advance, ready for retail sale, comply with the Labelling of Food Order 1946 (S.R. & O. 1946 No. 2169), and are not misleading as to its nature, substance, or quality, or in particular as to its nutritional or dietary value, in contravention of the Defence (Sale of Food) Regulations, 1943.

The Ministry of Food is prepared to advise traders about their labels, and importers who require such advice should address their enquiries to the Food Standards and Labelling Division of that Ministry, Devonshire House, Mayfair Place, Piccadilly, W.1. Such enquiries should be accompanied by three copies of the label or labels in question, together with a quantitative statement of the composition of the food. All information thus given will be treated as strictly confidential.

Information and Advice

Canning of Cod Livers

B.1722. *We should like to have some information on the canning of cod livers.* (London.)

Particulars on the canning of cod livers were published in 1940 by the Director of the Gaspe Fisheries Experimental Station of the Fisheries Research Board of Canada. The essential steps are as follows:

Only fresh cod livers must be used. On arrival at the cannery all livers should be held in metal containers, packed in finely crushed ice, until used. All livers must be thoroughly washed in clean running, cool water, and those not fresh or all white in colour must be discarded. The washed livers are brined in cool saturated pickle, containing a small amount of saltpetre, for thirty-five minutes.

Formula for this pickle consists of 9 gallons of water, 25 lb. table or dairy salt, and 10 oz. saltpetre. The pickle should be kept up to strength and changed frequently.

After brining, the livers are spread on trays and allowed to drain. They are then brought to the packing table, where they are placed in small tins such as are used for canning fish or lobster paste (3 oz. or smaller). The cans should be well filled, allowing not more than $\frac{1}{8}$ in. headspace. After exhausting the cans for approximately eight minutes in a steam or exhaust box, they are sealed and processed at 240° F. for thirty minutes (3 oz. cans). The cans are cooled in cold water immediately after removal from the retort.

Information Supplied

B.1662. *Formulae for fish and meat pastes.* (Eire.)

B.1664. *The production, properties, and use of hydrous feculose.* (Lanark.)

B.1666. *Ice cream recipes.* (Lincs.)

B.1667. *Suppliers of appropriate equipment for the manufacture of flavouring extracts and fruit essences.* (London.)

B.1671. *Manufacturers of an electronic cooker.* (Surrey.)

B.1673. *Keeping gherkins and other cucumber pickles green in vinegar solution; suppliers of a machine for peeling and tailing onions.* (Lancs.)

B.1679. *Names and addresses of manufacturers of: tinplate for the canning of fish; tin box machinery; herring boning machinery; and canning machinery for sardines.* (London.)

B.1681. *Suppliers of machinery for slicing oranges, etc., and suppliers of bottles.* (London.)

B.1682. *Firm supplying drinking straws.* (Lanark.)

B.1683. *Suppliers of lecithin of soya origin.* (Essex)

B.1685. *Manufacturers of Cellophane printed wrappers.* (India.)

B.1686. *Manufacturers of a machine for topping, tailing, and peeling onions; suppliers of paper caps for jars and of onions for pickling.* (Mon.)

B.1687. *Name and address of a firm engaged in the production of dehydrated potatoes.* (Lancs.)

B.1687a. *Suppliers of agar-agar.* (Denmark.)

B.1688. *The use of saccharin in bottling fruit.* (Eire.)

B.1689. *Literature on the subject of frozen pastry, and information on the new process known as "Frigid-Dough."* (Glam.)

B.1691. *Data on sugar production and supplies.* (London.)

B.1692. *Literature on the subject of edible animal fats.* (London.)

B.1693. *Manufacturers of open mesh bags.* (Lancs.)

B.1695. *Firms supplying the equipment for the production of potato crisps.* (S. Africa.)

B.1696. *Names and addresses of mustard mill manufacturers; also recipes for salmon and shrimp, and bloater pastes.* (Norway.)

B.1697. *Literature dealing with the subject of refining beef fat.* (Australia.)

B.1698. *Suppliers of a can opener, capable of standing up to commercial usage.* (Northants.)

B.1699. *Information regarding ink used for printing material which comes into contact with food.* (London.)

B.1702. *British manufacturers of concentrated pure fruit juices.* (N. Ireland.)

B.1704. *Suppliers of celery powder.* (N. Ireland.)

B.1708. *Information regarding "Filtragol" and "Pectinol."* (London.)

B.1712. *Manufacturers of electric delivery vans and trucks.* (Czechoslovakia.)

B.1713. *Manufacturers of aluminium trays suitable for the quick freezing of fish.* (Yorks.)

B.1714. *Firms manufacturing brown and white vinegar.* (Eire.)

B.1715. *Suppliers of machinery for the manufacture of sausages, and for the bleaching process in the preparation of tripe.* (Lancs.)

B.1719. *Suppliers of machinery for the production of tapioca flakes.* (Spain.)

B.1721. *Literature on groundnut oil extraction.* (China.)

B.1726. *Manufacturers of machinery for packing meat and fish pastes into small glass containers.* (Wilts.)

Information Required

B.1717. *Suppliers or manufacturers of gelatinised wheat flour, malted wheat flour, and the product "Deglu," believed to be used in ice cream mixes.* (London.)

B.1751. *Name and address of the manufacturers of a hand emulsifier for emulsification of essential oils and water, etc. The brand name "Empire" is indented on the machine.* (Sussex.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstract of Recent Specification

Improvements in Meat-Cooking Cartons

This invention relates to containers or receptacles for holding chopped or minced meats of various kinds during the cooking operation or moulding after processing.

The shortage of metals prohibits the manufacture of sheet metal containers for this purpose and the principal object of the present invention is to provide a carton or cardboard holder for effectively holding meats and retaining their juices and other qualities while subjected to the heat of cooking and which will effectively withstand the temperatures to which such goods are subjected.

In accordance with the present invention a meat-cooking carton comprises a folded sheet of surfaced card forming a seamless container presenting smooth interior surfaces, and an outer heat-resisting casing for holding the folded seamless sheet and its contents. Such a carton has the advantages that the smooth interior surfaces of the container facilitate the ready removal of the finished cooked product and the heat-resisting casing forms a strong and effective enclosure for said folded carton while effectively resisting the heat of the oven.

580,826. Christopher Arthur Pemberton.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

582,746. Sharman, C. F., and Coulson, D. A.: Moisture-resisting packages.

582,830. Walmsley, J.: Plant support for fruiting branches and like purposes.

582,858. Bennett, H. W.: Glass sealing machines.

582,904. Huzenlaub, E. G.: Process for enriching cereal grains with natural vitamins.

582,918. Cleveland, F. J. (Granular Foods, Inc.): Solid expanded coffee corn syrup mixture.

582,999. Constantine, W. W. (General Motors Corporation): Protector devices for electric motors in refrigeration apparatus.

583,030. California Fruit Growers' Exchange: Making of jellies.

583,038. Boothby, A. M.: Containers made of paper and the like.

583,045. Auto - Klean Strainers, Ltd., and Stone, L. H.: Filtering or straining apparatus.

583,064. Brass - Cav. S.A.R.L.: Machines for labelling bottles and other containers.

583,082. Shields, R. (United Dairy Equipment Co.): Emulsifying apparatus.

583,120. Kellogg Co.: Method of producing a ready-to-eat cereal product.

583,145. Power, P. B., and Jolly, T.: Slicing machines.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

LINK.—639,615. Edible oils, edible fats, jellies (for food), jelly powders, jelly crystals, essence of rennet. **Cumming, Parsons, Ltd.**, Top Lilley Street Works, St. Mary Street, Queen's Road, Manchester, 9; Manufacturing Chemists.

SULAC.—643,743. Milk products (for food). **Dried Milk Products, Ltd.**, 1, Stoke Road, Guildford, Surrey; Merchants.

TEN LITTLE NIGGER BOYS.—643,985. Confectionery (not medicated). **J. Long, Ltd.**, 5, Bell Street, Whitchurch, Hampshire; Manufacturers.

CARABERY.—644,730. Dried seaweed prepared for use as food and as an ingredient in food. **J. P. McCarthy and Co. (Brokers), Ltd.** (a Company incorporated under the laws of Eire), 6, South Mall, Cork; Manufacturers.

GREEN SLEEVES.—645,182. Chocolates and confectionery (not medicated). **A. S. Wilkin, Ltd.**, Cremona Park, Benton Road, Newcastle-on-Tyne, Manufacturers.

New Companies

Cream Specialities, Limited. (425617.) 10, Mason Lane, Richmond, Sheffield, 9. To carry on bus. of manufacturers of and dealers in confectioners' creams, bakers' sundries, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: J. E. Parker, 221, Chippingham Road, Sheffield, 7; R. Unwin, 10, Mason Grove, Sheffield, 9.

Rigby Distributive Agencies, Limited. (425709.) To carry on bus. of general merchants, agents for foodstuffs, etc. Nom. cap.: £1,500 in £1 shares. Dirs.: not named. Subs.: A. E. Rigby, 40, Ryedale, Peckham, S.E.; E. Mayo, 3, Goodwins Court, W.C.2 (acct.).

P. Hogg and Sons, Limited. (426787.) 32A, Head Street, Liverpool, 8. To carry on business of refrigeration and electrical engineers, etc. Nom cap.: £500 in £1 shares. Dirs.: P. T. O'Halloran, H. O'Halloran, and D. O'Halloran, all of 56, Dudley Road, Liverpool, 15.

Coventry Refrigeration Developments, Limited. (426970.) Pedmore Road, Woodside, nr. Dudley. Nom. cap.: £10,000 in £1 shares. Permt. dirs.: W. D. Jones, Melrose, Aberdovey; P. Pioli, 31, Turls Hill Road, Sedgley, Staffs; G. D. Broadfoot, The Cottage, Stableford, Shropshire.

Francis J. Smith, Limited. (427253.) 8 and 9, North End, Wisbech. To take over bus. of wholesale fruit and potato merchant carried on at Wisbech, Cambs., by F. J. Smith. Nom. cap.: £50,000 in 10,000 "A," 35,000 "B" of £1 and 50 Investment shares of £100 each. Dirs.: F. J. Smith (permt. mang. dir. and ch.), Mrs. F. Smith and Janet S. Smith, all of Lancewood, Leverington, Cambs.; B. V. Smith and W. H. Searle, Rannoth Road, Wisbech.

E. Ladbrooke and Son, Limited. (427054.) 33, St. Marie Street, Brigend. To carry on bus. of manufacturers of and dealers in milk, cream, condensed milk, etc. Nom. cap.: £1,000 in £1 shares. Permt. dirs.: E. V. Ladbrooke, Edith M. Ladbrooke, and G. T. Ladbrooke, all of 33, St. Marie Street, Bridgend.

John Bryson (Keswick), Limited. (427075.) 42, Main Street, Keswick. To take over the bus. of a baker carried on as "J. A. Heptinstall" at Keswick. Nom. cap.: £12,000 in £1 shares. Dirs.: John Bryson, jnr., 42, Main Street, Keswick (permt.); J. Bryson, senr., Baitstrand Farm, Berwick-on-Tweed (permt.); H. Davidson, 3, Leonard Street, Keswick.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.